

HRS DOCUMENTATION RECORD COVER SHEET

Name of Site: Compass Plaza Well TCE

EPA ID No.: MON000706143

Contact Persons

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Pathways, Components, or Threats Not Scored

The surface water migration, soil exposure, and air migration pathways were not scored in this Hazard Ranking System (HRS) evaluation. No releases or impacts to surface water and/or air migration pathway were identified by previous investigations. These migration pathways do not contribute significantly to the overall site score. The soil exposure pathway was not evaluated because no significant areas of soil contamination were documented in the top two feet of soil and no contamination was documented on the property of a residence and within 200 feet of the residence. Therefore, this exposure pathway would not be expected to contribute to the overall site score.

HRS DOCUMENTATION RECORD

Name of Site: Compass Plaza Well TCE

EPA Region: 7

Date Prepared: September 2011

Street Address of Site*: 201 South Marshall Street

City, County, State, Zip Code: Rogersville, Greene County, Missouri 65742

General Location in the State: The City of Rogersville is located in southwest Missouri, 8.4 miles east of Springfield, Missouri on U.S. Highway 60.

Topographic Map: United States Geological Survey. Rogersville, Missouri quadrangle: 7.5-Minute Series Topographic Map, N3700-W9300/7.5. 1970.

Latitude: 37.109009° North

Longitude: 93.083168° West

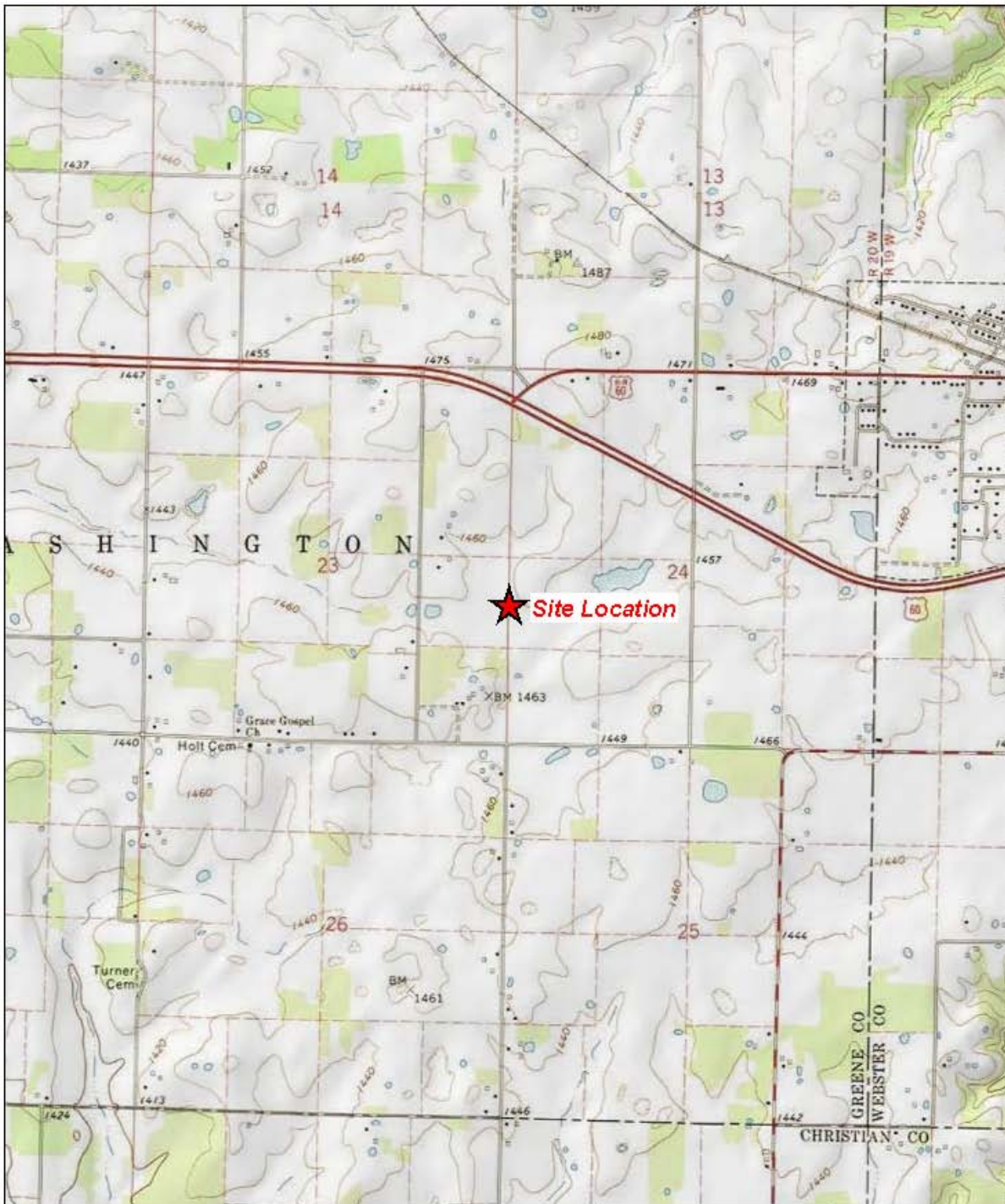
The latitude and longitude listed above specify the approximate center of the ground water plume associated with Compass Plaza Well TCE. Google Earth (www.google.com/earth/index.html) was used to obtain the coordinates (Ref. 21). Figure 1 shows the location of Compass Plaza Well TCE.

Scores

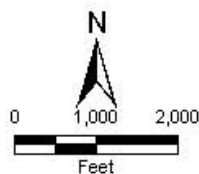
Ground Water Migration Pathway	100
Surface Water Migration Pathway	Not scored
Soil Exposure Pathway	Not scored
Air Migration Pathway	Not scored

HRS SITE SCORE 50.00

*The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known “releases or threatened releases” of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been “deposited, stored, placed, or otherwise come to be located.” Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where contamination has come to be located.



Source: USGS Rome Bull, MO 7.5 Minute Topo Quad, 1970



Compass Plaza Well TCE
Rogersville, Missouri

Figure 1
Site Location Map

TETRA TECH EM INC.

Date: 6/16/2011 Drawn by: BLS/ghg Project No: 1060-L-16.0/26.666

**HRS SITE SCORE
WORKSHEET FOR COMPUTING HRS SITE SCORE**

	<u>S</u>	<u>S²</u>
1. Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	100	10,000
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	NA
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	NA
2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	NS	NA
3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	NA
4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	NA
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	100	10,000
6. HRS Site Score Divide the value on line 5 by 4 and take the square root		50.00

Notes:

NS Not Scored
NA Not Applicable

**HRS TABLE 3-1 — GROUND WATER MIGRATION PATHWAY SCORESHEET
COMPASS PLAZA WELL TCE**

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release:	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	NS
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics:		
4. Toxicity/Mobility	a	10,000
5. Hazardous Waste Quantity	a	100
6. Waste Characteristics	100	32
Targets:		
7. Nearest Well	50	50
8. Population:		
8a. Level I Concentrations	b	580
8b. Level II Concentrations	b	0
8c. Potential Contamination	b	101
8d. Population (lines 8a + 8b + 8c)	b	681
9. Resources	5	0
10. Wellhead Protection Area	20	5
11. Targets (lines 7 + 8d + 9 + 10)	b	736
GROUND WATER MIGRATION SOURCE FOR AN AQUIFER		
12. Aquifer Source [(lines 3 x 6 x 11)/82,500] ^c	100	100
GROUND WATER MIGRATION PATHWAY SCORE		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	100

^aMaximum value applies to waste characteristics category.

^bMaximum value not applicable.

^cDo not round to nearest integer.

NS Not Scored

REFERENCES

Reference Number	Description of the Reference
1	U.S. Environmental Protection Agency (EPA). Hazard Ranking System, 40 CFR Part 300, Appendix A, 55 FR 51533. December 14, 1990. Entire rule can be found on the World Wide Web at http://www.epa.gov/superfund/sites/npl/hrsres/#HRS%20Rule Excerpt. 1 page.
2	EPA. Superfund Chemical Data Matrix. Interim revised values for trichloroethene (TCE), Appendix A, BI and BII and Table BI for other compounds. Accessed online at: http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm Revised October 23, 2006 (for TCE), other compounds January 27, 2004. Excerpt. 14 pages.
3	United States Geological Survey. Rogersville, Missouri quadrangle: 7.5-Minute Series Topographic Map, N3700-W9300/7.5. 1970. Location of the center of the ground water plume added by Tetra Tech. 1 sheet.
4	Capell, Pia and Michael Stroh. Missouri Department of Natural Resources. <u>Site Inspection/Removal Site Evaluation Report</u> for the Compass Plaza TCE Well Site, Greene County, Missouri. EPA ID Number MON000706143. February 1, 2011. 1,570 pages.
5	Capell, Pia. Missouri Department of Natural Resources. <u>Abbreviated Preliminary Assessment Checklist</u> for the Compass Plaza TCE Well Site, Greene and Webster Counties, Missouri. EPA ID Number MON000706143. March 25, 2010. 6 pages.
6	Jacobs Engineering Group, <u>Draft Site Inspection Prioritization Positronics Industries site</u> . EPA contract number; 68-W8-0122, work assignment number 53-7WZZ. January 1994. 67 pages.
7	EPA. Envirofacts Warehouse-CERCLIS Query. On-line address: http://iaspub.epa.gov/enviro/cerclis_web.report?pgm_sys_id=MOD007447196 . Accessed March 29, 2011. 2 pages.
8	Bachle, Peter. Geological Survey Program, Division of Geology and Land Survey. Memorandum- <u>Geohydrologic Summary of Compass Plaza Well Site</u> . April 15, 2010. 30 Pages.
9	Hughes, Harold E. U.S. Department of Agriculture, Soil Conservation Service. <u>Soil Survey Of Greene and Lawrence Counties, Missouri</u> . March 1982. Five excerpted pages.
10	Web Soil Survey Map for Compass Plaza TCE Well site. From U.S. Department of Agriculture, Natural Resource Conservation Service online mapping tool found at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx . Map created January 13, 2011. Three pages.
11	Miller, Don E. and James E. Vandike. Missouri Department of Natural Resources' Division of Geology and Land Survey. <u>Missouri State Water Plan Series Volume II Groundwater Resources of Missouri</u> . Water Resources Report Number 46. 1997. 24 excerpted pages.
12	State of Missouri Division of Geological Survey and Water Resources. <u>Well Log for City of Rogersville Well Number 2</u> , Log No. 27997. Logged in September 1976. Well log obtained on-line from: http://www.dnr.mo.gov/env/wrc/logmain/greene.pdf Four pages.
13	Tetra Tech EM, Inc. (Tetra Tech). <u>Quality Assurance Project Plan for Removal Action at the Compass Plaza TCE site</u> . Contract No. EP-S7-06-01, Task Order No. 0194. August 13, 2010. 17 pages.

Reference

Number	Description of the Reference
14	Scroggin, Tom (TS), Tetra Tech START, and Doug Ferguson, EPA Region 7 Superfund Emergency Response and Removal (SUPR/ER&R). <u>Chain of Custody Forms, Field Sheets and Logbook for Compass Plaza Well TCE Removal Action Support.</u> For Analytical Services Request (ASR) number 5049 for sampling event from August 16 - 25, 2010. 31 pages.
15	Davis, Michael F., Chief, Chemical Analysis and Response Branch, Environmental Services Division, U.S. Environmental Protection Agency Region 7 to Doug Ferguson, EPA Region 7 Superfund Emergency Response and Removal (SUPR/ER&R). <u>Transmittal of Sample Analysis Results for ASR #5049 for the Compass Plaza Well TCE sampling.</u> September 16, 2010. 18 pages.
16	EPA Region 7. <u>HRS Analysis Results Supplement for ASR #5049 for the Compass Plaza Well TCE sampling.</u> January 7, 2011. 34 pages.
17	Ellis, Harry V. III, PhD, Tetra Tech, to Tetra Tech Project file. <u>Review and Validation of the Missouri Department of Natural Resources (MDNR) Data and Sample Quantitation Limit.</u> Memorandum. February 14, 2011. 24 pages.
18	Sims, Judith L. and others. Superfund Technology Support Center for Ground Water. <u>Reductive Dehalogenation of Organic Contaminants in Soils and Groundwater.</u> Office of Solid Waste and Emergency Response. EPA/540/4-90/054. January 1991. 12 pages.
19	Ferguson, Doug, EPA Region 7 Superfund Emergency Response and Removal (SUPR/ER&R). <u>Chain of Custody Forms and Field Sheets for Compass Plaza Well TCE Removal Action Support.</u> For Analytical Services Request (ASR) number 5255 for sampling event from February 22 - 24, 2011. 37 pages.
20	Missouri Department of Natural Resources. <u>Source Water Assessment Plan Maps and well information for the Rogersville PWSS No. 5010699.</u> Prepared by the Center for Applied Research and Environmental Systems, University of Missouri. Map update May 14, 2010. 4 pages.
21	Zimmermann, David, Tetra Tech Project Manager. Project Note Regarding the Latitude and Longitude for the Compass Plaza TCE Well site (CERCLIS ID Number: MON000706143). July 25, 2011. 1 page.
22	Missouri Department of Natural Resources, Public Drinking Water Program. Drinking Water <u>Source Water Assessment Plan.</u> Plan accessed online at http://drinkingwater.missouri.edu/swap/ on May 19, 2011. 2 pages (excerpt).
23	Missouri Department of Natural Resources, Division of Geology and Land Survey. High Yield and Public Well Record and Pump Information Data form for well with reference number of 00331792. February 18, 2004. 1 page.
24	Missouri Department of Natural Resources, Division of Geology and Land Survey. Water Well Certification and Pump Information Record form for well with reference number of 279327. October 12, 2001. 1 page.
25	Missouri Department of Natural Resources, Division of Geology and Land Survey. Domestic/Multifamily Well Record and Pump Information Data form for well with reference number of 00421957 identified as the Jamestown Irrigation well. August 25, 2009. 1 page.
26	Missouri Department of Natural Resources. <u>Source Water Assessment Plan Maps and well information for Bill's Quick Mart Well #1 PWSS No. 5258130.</u> Prepared by the Center for Applied Research and Environmental Systems, University of Missouri. Map update April 7, 2011. 3 pages.

Reference

Number	Description of the Reference
27	Missouri Department of Natural Resources, Division of Geology and Land Survey (DNR DGLS). Missouri Sample Well-Log Library for well with Log Number of 025206. October 1967. 2 pages.
28	Missouri Department of Natural Resources, Division of Geology and Land Survey (DNR DGLS). Missouri Sample Well-Log Library for well with Log Number of 029048. April 22, 2004. 1 page.
29	Missouri Department of Natural Resources, Division of Geology and Land Survey (DNR DGLS). Missouri Sample Well-Log Library for well with Log Number of 014464. May 3, 1956. 2 pages.
30	Missouri Department of Natural Resources, Division of Geology and Land Survey. High Yield and Public Well Record and Pump Information Data form for well with reference number of 00251660. July 3, 2000. 1 page.
31	Scroggin, Tom. Tetra Tech START Project Manager. Project Memorandum Regarding the Records Search for the Compass Plaza TCE Well site (CERCLIS ID Number: MON000706143). July 18, 2011. 1 page.
32	U.S. Census Bureau. American FactFinder. Rogersville City, Missouri, Table QT-P11, Households and Families: 2010, 2010 Census Summary File 1. Accessed on line at: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_QTP11&prodType=table . Accessed August 12, 2011. 2 pages.
33	Logan-Rogersville R-VIII School District. Buildings in our District. Document accessed online at: http://www.logrog.net/MiscPaperWork/BuildingsINourDISTRICT.htm . Accessed July 15, 2011. 1 page.
34	Tetra Tech EM, Inc. (Tetra Tech). Addendum #1 to the <u>Quality Assurance Project Plan for Removal Support at the Compass Plaza TCE site</u> . Contract No. EP-S7-06-01, Task Order No. 0194. February 24, 2011. 18 pages.
35	Scroggin, Tom (TS), Tetra Tech START, and Doug Ferguson, EPA Region 7 Superfund Emergency Response and Removal (SUPR/ER&R). <u>Chain of Custody Forms and Field Sheets for Compass Plaza Well TCE Removal Support</u> . For Analytical Services Request (ASR) number 5367 for sampling event from May 10 – 12, 2011. 79 pages.
36	Davis, Michael F., Chief, Chemical Analysis and Response Branch, Environmental Services Division, U.S. Environmental Protection Agency Region 7 to Doug Ferguson, Superfund Emergency Response and Removal North Branch (SUPR/ERNB). <u>Transmittal of Sample Analysis Results for ASR #5367 for the Compass Plaza Well TCE sampling</u> . June 10, 2011. 46 pages.
37	Missouri Department of Natural Resources, Division of Geology and Land Survey (DNR DGLS). Missouri Sample Well-Log Library for well with Log Number of 012589. March 1954. 2 pages.
38	State of Missouri Division of Geological Survey and Water Resources. <u>Well Log for City of Rogersville Well Number 1</u> , Log No. 12589. Logged in January 1954. Well log obtained on-line from: http://www.dnr.mo.gov/env/wrc/logmain/greene.pdf . 4 pages.
39	EPA Region 7. <u>Analysis Information: ASR 4907</u> . May 10, 2010. 4 pages.

SITE DESCRIPTION

Compass Plaza Well TCE is located in southeastern Greene County near the Webster and Christian County borders. The approximate center of the ground water plume which encompasses the site is 1.4 miles north of the border of Greene and Christian Counties and 1 mile west of the Greene and Webster County border (see Figure 1). The contaminated ground water plume is on the west side of Rogersville, Missouri. Rogersville is located in Greene and Webster counties. The site consists of contaminated ground water that has impacted domestic and irrigation wells. The primary contaminant of concern in ground water is trichloroethene (TCE) (Ref. 4, pp. 4, 5) although other chlorinated solvents have been reported in ground water samples in addition to TCE (Ref. 4, p. 8). The Compass Plaza Strip mall is located at 201 South Marshall Street on the western edge Rogersville, Missouri. An initial detection of TCE was found in the drinking water well that serves Compass Plaza on June 18, 2009 (Ref. 5, p. 1). Consequently, additional sampling was conducted of eight public water wells in the area (Ref. 5, p. 1). Of these, two had detections of TCE: one which supplies the Citizen's Bank of Rogersville and another that provides irrigation water (Ref. 5, p. 1).

The Compass Plaza Well TCE site is a ground water plume in Greene County near Compass Plaza, a commercial area on the city of Rogersville's western edge. Following routine public drinking water monitoring in June 2009, TCE was detected in the Compass Plaza strip mall well at levels below the EPA Maximum Contaminant Level (MCL) for drinking water. Two nearby wells were sampled and also showed the presence of TCE below the MCL. The site was referred by the MDNR's Public Drinking Water Branch (PDWB) to the Hazardous Waste Program (HWP) in March 2010 for further assessment under CERCLA (Ref. 4, p. 4).

The site was discovered and entered into CERCLIS on March 24, 2010 (Ref. 4, p. 4). An Abbreviated Preliminary Assessment (APA) was completed on March 25, 2010 (Ref. 5, p. 1). The site was recommended for further CERCLA assessment to identify the source of the TCE and further evaluate exposure (Ref. 5, p. 5). A site inspection/removal site evaluation (SI/RSE) was initiated by MDNR on April 1, 2010 and included multiple sampling events (Ref. 4, pp. 4, 5, 25, 26). By mid June, 2010, the State had sampled 121 wells and 13 contained TCE; six of these wells had TCE at concentrations exceeding the EPA MCL (Ref. 4, pp 1538, 1539). Also as part of the SI, the state conducted a search for possible sources of the ground water contamination and collected soil samples from suspect areas (Ref. 4, pp. 9 – 17). No source of the TCE in ground water was identified (Ref. 4, p. 17). A removal action was initiated by EPA on August 10, 2010, and is ongoing (Ref. 4, p. 4). The general objective of the removal action is to eliminate, through the provision of a permanent alternative water supply or whole-house filtration, human exposure of TCE and/or other hazardous substances present in ground water (Ref. 4, p. 1557).

The site lies on the eastern border of the Springfield Plateau of the Ozark Plateau sub-province of the Interior Highlands physiographic province in Missouri. This area is characterized by rolling upland hills with low relief (Ref. 8, p. 1). Based on topographic maps, there are many sinkholes near the site. There are also 14 known springs near the site. Based upon this information and the limestone bedrock that underlies the site and comprises the uppermost aquifer, the site lies within a karst area (Refs. 4, p. 19; 8, p. 5).

After contamination was identified in ground water west of Rogersville, staff from the State of Missouri's Southwest Regional Office (SWRO), the U.S. Environmental Protection Agency (EPA), and Missouri Department of Natural Resources (MDNR) Hazardous Waste Program (HWP) met on July 7, 2010 to review historical file information and potential source area locations reported to staff from various entities in the Rogersville area (citizens, public works employees, city office staff) (Ref. 4, p. 9). As shown on Figures 2 and 3 of the SI/RSE report, five potential areas for investigation were identified; two north of highway 60 (Compass Plaza Cleaners & Laundromat and Positronics Inc.), and three south of highway 60 (a former woody debris burn pile area, a residential property at the location of a TCE-contaminated private well, and an industrial area east of Rogersville that is served by three private wells (Ref. 4, pp. 9, 42, 43). A sampling event was conducted on July 27-28, 2010, and documented in a Site Inspection Sampling Report (Ref. 4, pp. 9, 1160). All samples during the investigation were analyzed for volatile organic compounds (VOC) (Ref. 4, p. 1165). During the MDNR SI/RSE soil samples were collected from the former Compass Cleaners & Laundromat which operated at the Compass Plaza strip mall from approximately 2004 to 2007 (Ref. 4, pp. 10, 42). Subsurface soil samples were collected near a solvent tank, and between the solvent tank and contaminated well at Compass Plaza (Ref. 4, pp. 10, 42). At the Positronics Inc. location, which is east of the Compass Plaza well, soil samples were collected from four borings located near a former lagoon and from an irrigation field where process waste water containing chlorinated solvents were once sprayed (Refs. 4, pp. 10, 11, 42; 6, pp. 4, 13, 18). At the former woody debris burn pile area, soil samples were collected from three boring located in an area where tree debris was burned following a 2007 ice storm (Ref. 4, pp. 12, 43). At the residential property where TCE was found at high concentrations in the private well (well 176), three soil borings were advanced in areas near sinkholes to determine if they may be a source for contamination (Ref. 4, pp. 12, 13, 43). MDNR sampled three private ground water wells east Rogersville located in an area used by various commercial businesses (Ref. 4, pp. 13, 14, 42). The wells were sampled to determine if ground water contamination exists east of Rogersville that would warrant additional investigation.

Of the five areas investigated, subsurface soil near the Compass Plaza Cleaners & Laundromat was shown to contain low concentrations (estimated) of tetrachloroethene (PCE) (Ref. 4, pp. 15, 16). Soil at the former Positronics Inc. facility and the former burn area contained low concentrations of non-chlorinated volatile organic compounds (VOC) (Ref. 4, pp. 15, 16), and all other sample collected to characterize possible areas of contamination did not contain any chlorinated volatile organic compounds (Ref. 4, pp. 15 – 18).

In December 2010, EPA investigated allegations of illegal dumping of spent solvents on a property around the Rogersville area (Ref. 31). Webster and Greene Counties' deeds records dating back to 1960 were searched to determine whether the person allegedly responsible for dumping solvents ever owned property in the Rogersville area. No records matching the name of the person in the allegation were found (Ref. 31).

As part of ongoing support to the EPA Region 7 removal program, in May 2011 Tetra Tech START collected additional soil and ground water samples to identify potential source areas and further delineate impacted private drinking water wells (Refs. 34, pp. 8, 11, 13; 35; 36, p. 3). Thirty-four soil samples were proposed to be collected at multiple depths in and around sinkholes, in a drainage feature, at the former Compass Plaza Laundromat, and at the former Positronics facility (Ref. 34, p. 13). Thirty soil samples were actually collected and submitted for VOC analysis from 13 soil borings (Refs. 35, pp. 1 – 30; 36, pp. 3, 5). The only chlorinated VOC detected in soils was tetrachloroethene (PCE) at a concentration of 30 micrograms per kilogram ($\mu\text{g/kg}$) in sample 5367-4 (Ref. 36, pp. 8 – 23). This sample was collected from a depth of 6 to 7 feet below ground surface at the former Compass Plaza Laundromat (Ref. 35, p. 4). No TCE or cis-1,2-DCE were reported in soil sample 5367-4 (Ref. 36, pp. 8, 9). No other soil sample contained detected levels of any chlorinated volatile organic compound (Ref. 36, pp. 2, 3, 8 – 23).

Investigations conducted to date have not identified the source of the TCE found in ground water. Therefore, this site will be scored as a ground water plume with no identified source.

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Ground Water Plume (with no identified source)

Number of source: 1

Source Type: Other (Ground Water Plume)

Description and Location of Source (with reference to a map of the site): Figure 2

Source 1 is a ground water plume located on the west side of Rogersville, Missouri. The well that serves the Compass Plaza is located behind the buildings in Compass Plaza and is located most closely to the former Compass Cleaners and Laundromat (Ref. 4, pp. 5, 41, 44, 48). The well, constructed in 2004, has a total depth of 750 feet and draws water from the Ozark Aquifer (Refs. 4, p. 7; 23). Prior to the summer of 2009, the Compass Plaza well was considered a non-community transient water supply (Ref. 4, p. 7). In the spring of 2009, the Graceland Daycare connected to the Compass Plaza well which changed the status of the well from a transient to a non-transient water supply (Ref. 4, p. 7). A non-transient non-community well is defined as a public water system that is not a community water system that regularly serves at least 25 of the same persons over 6 months per year (Ref. 4, p. 7). Non-transient non-community wells are required to conduct periodic chemical testing. The first such testing was conducted by the MDNR's Public Drinking Water Branch (PDWB) on June 18, 2009 (Ref. 4, pp. 7, 62, 160). TCE was detected 3.73 micrograms per liter ($\mu\text{g/L}$) (Ref. 4, pp. 7, 62, 63). Seven public drinking water wells located nearest the site were sampled on a number of occasions between March and July 2010 (Ref. 4, p. 25). The samples collected by the PDWB documented TCE contamination in a well serving the Citizen's Bank of Rogersville and an irrigation well referred to as the Jamestown Irrigation well (Ref. 4, pp. 7, 28, 41). These wells are shown in Figures 1 and 5 of the SI/RSE report (Ref. 4, pp. 41, 45).

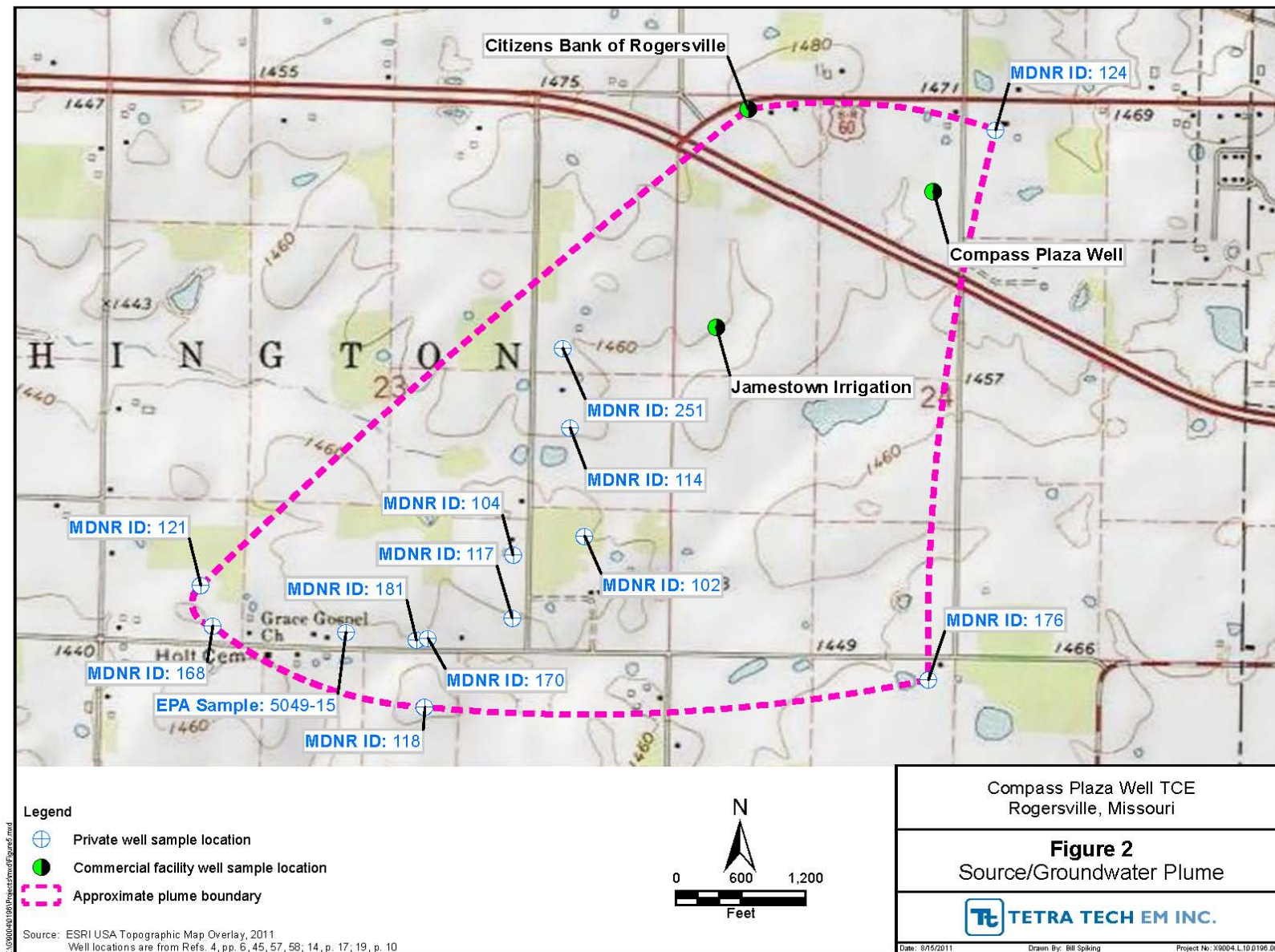
Following the initial detection of TCE in the Compass Plaza public well in June 2009, successive rounds of sampling were conducted by MDNR beginning with wells nearest Compass Plaza and extending outward (Ref. 4, p. 25). After several rounds of sampling public wells, the site was referred to the Hazardous Waste Program (HWP) in March 2010 for further assessment under CERCLA (Ref. 4, pp. 4, 7). Ground water sampling by the HWP included public and private drinking water wells (Ref. 4, pp. 25, 26). Sampling plans prepared for the domestic well sampling events are provided in the appendix of the SI/RSE report (Ref. 4, pp. 1499-1505, 1514-1524, 1538-1543). Ground water samples collected by MDNR were analyzed by the state's environmental laboratory within the Environmental Services Program (ESP) by EPA Safe Drinking Water Act Method 524.2 for VOCs (Ref. 4, pp. 26, 1503).

Private wells located near the site were identified using well records from MDNR Division of Geology and Land Survey (DGLS) databases. Additional wells were added to the sampling program based on requests by private residents following a public meeting held in Rogersville on May 25, 2010. In all, access was gained to 121 private drinking water wells, and these were sampled over the period between March and September of 2010 (Ref. 4, p. 26). The list of sampled private wells and the designated code for each well sampled by the HWP is included in Table C1 of the SI/RSE report (Ref. 4, pp. 26, 57 -59). Figure 5 of the SI/RSE report shows all public and private well sampling locations (Ref. 4, p. 45).

During initial rounds of sampling, samples were collected only from outside taps nearest the wellhead. Subsequent rounds of sampling also included sample collection at an inside tap (typically the kitchen). Duplicate samples were collected, and trip blanks processed as specified in the Quality Assurance Project Plan (QAPP) (Ref. 4, p. 26). All samples were submitted to the MDNR's ESP laboratory for analysis of VOCs by EPA drinking water method 524.2 (Ref. 4, p. 26). The analytical data were validated by Tetra Tech (Ref. 17).

In the summer of 2010, MDNR requested that EPA Region 7 to provide alternative water supply to households drinking contaminated ground water (Ref. 4, p. 1557-1558). EPA Region 7 tasked the START contractor to provide removal assessment support by resampling State identified contaminated wells and also perform post filtration sampling at wells where whole house filtration systems were to be installed (Ref. 13, pp. 5, 11, 13). Samples were collected on August 16 and 17, 2010 and post filtration samples were collected on August 25, 2010 (Ref. 14). EPA sampled the same wells that the MDNR HWP had previously sampled where TCE contamination had been found. In addition one new well was sampled at a residence that was not previously sampled by the state (Ref. 14, p. 17). This well contained TCE and will be referred to by the sample number which is 5049-15 (Ref. 15, p. 13).

Ground water wells sampled by MDNR PDWB and HWP and by EPA Region 7 that have been shown to be contaminated by TCE are shown on Figure 2 of this documentation record.



2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THIS SOURCE

The table below presents all the ground water wells at the site that have been documented to contain one or more chlorinated VOCs at a concentration significantly above background concentration as established by HRS rule, Table 2-3 (Ref. 1, Section 2.3 and Table 2-3). Further discussion of the general characteristics of the aquifer is presented in Section 3.0.1 of this documentation record. What is known about the depths of the contaminated wells and the presentation of background well information is provided in Section 3.1.1 of this documentation record. The location of the wells presented below is shown on Figure 2.

GROUND WATER CONCENTRATIONS

Sample ID	Sample Designation	Sample Date	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Sample Quantitation Limit** (µg/L)	References
Compass Plaza Well	AB15892	03/08/2010	TCE <i>cis</i> -1,2-DCE	3.07 1.07	0.5 0.5	4, pp. 28, 68, 69, 165; 17, p. 1
	AB16170	03/16/2010	TCE <i>cis</i> -1,2-DCE	3.84 1.21	0.5 0.5	4, pp. 28, 92, 93, 170; 17, p. 1
Citizen's Bank of Rogersville	AB15915	03/08/2010	TCE <i>cis</i> -1,2-DCE	2.25 0.66	0.5 0.5	4, pp. 74, 75, 163; 17, p. 1
	AB16169	03/16/2010	TCE <i>cis</i> -1,2-DCE	2.11 0.69	0.5 0.5	4, pp. 90, 91; 17, p. 1
Jamestown Irrigation well	AB16171	03/16/2010	TCE <i>cis</i> -1,2-DCE	4.96 1.84	0.5 0.5	4, pp.28, 94, 95, 169; 17, p. 1
MDNR 176 ^a	1000438	04/15/2010	TCE 1,1,2-TCA	313 0.84	0.5 0.5	4, pp. 29, 57, 198, 199, 550, 551, 604, 605, 618, 619; Ref. 17, p. 1.
	1003701	04/22/2010	TCE 1,1,2-TCA	323 0.83	0.5 0.5	
	5049-11	08/17/2010	TCE	180	6.3	14, p.13; 15, pp. 10, 11; 16, p. 18
MDNR 168 ^a	1000747	04/15/2010	TCE	1.10	0.5	4, pp. 29, 57, 198, 199, 512, 572, 1327, 1377, 1378; Ref. 17, p. 1.
	1003692	04/21/2010	TCE	1.33	0.5	
	1003715	09/13/2010	TCE <i>cis</i> -1,2-DCE	1.41 0.5	0.5 0.5	
	5049-3	08/16/2010	TCE	1.1	0.5	14, p.5; 15, pp. 6, 7; 16, p. 5
MDNR 170 ^a	1000750	04/15/2010	TCE <i>cis</i> -1,2-DCE	2.27 0.83	0.5 0.5	4, pp. 29, 57, 198, 199, 524, 581, 582; Ref. 17, p. 1.
	1003697	04/21/2010	TCE <i>cis</i> -1,2-DCE	2.32 0.92	0.5 0.5	
	5049-5	08/16/2010	TCE <i>cis</i> -1,2-DCE	1.2 0.58	0.5 0.5	14, p.7; 15, pp. 8, 9; 16, pp. 7, 8
MDNR 102 ^a	1000689	03/30/2010	TCE <i>cis</i> -1,2-DCE	5.41 1.91	0.5 0.5	4, pp. 28, 57, 198, 199, 234, 235, 378, 404; Ref. 17, p. 1
	1000720	04/14/2010	TCE <i>cis</i> -1,2-DCE	5.44 2.03	0.5 0.5	
	5059-18	08/17/2010	TCE <i>cis</i> -1,2-DCE	5.4 1.8	0.5 0.5	14, p.20; 15, pp. 14, 15; 16, pp. 27 - 29

GROUND WATER CONCENTRATIONS (Continued)

Sample ID	Sample Designation	Sample Date	Hazardous Substance	Hazardous Substance Concentration (µg/L)	Sample Quantitation Limit** (µg/L)	References
MDNR 104 ^a	1000724	04/14/2010	TCE	0.89	0.5	4, pp. 28, 57, 198, 199, 420, 1366, 1381, 1382; Ref. 17, p. 1
	1003725	09/15/2010	TCE <i>cis</i> -1,2-DCE	1.26 0.65	0.5 0.5	
	5049-7	08/16/2010	TCE	1.1 J*	0.5	
MDNR 118 ^a	1003785	03/31/2010	TCE <i>cis</i> -1,2-DCE	4.79 1.61	0.5 0.5	4, pp. 29, 57, 198, 199, 238, 239, 390, 424; Ref. 17, p. 1
	1000725	04/14/2010	TCE <i>cis</i> -1,2-DCE	5.19 1.8	0.5 0.5	
	5049-13	08/17/2010	TCE	1.3	0.5	
MDNR 121 ^a	1003790	03/31/2010	TCE	0.65	0.5	4, pp. 29, 57, 198, 199, 236, 237, 342, 444; Ref. 17, p. 1
	1000730	04/14/2010	TCE	0.97	0.5	
	5049-6	08/16/2010	TCE	0.66	0.5	
MDNR 117 ^a	1003784	03/30/2010	TCE <i>cis</i> -1,2-DCE	3.57 1.28	0.5 0.5	4, pp. 28, 57, 198, 199, 238, 239, 386, 456; Ref. 17, p. 1
	1000733	04/14/2010	TCE <i>cis</i> -1,2-DCE	2.9 1.36	0.5 0.5	
	1000734	04/14/2010	TCE <i>cis</i> -1,2-DCE	6.74 2.47	0.5 0.5	
MDNR 114 ^a	1003781	03/30/2010	TCE <i>cis</i> -1,2-DCE	6.36 2.7	0.5 0.5	4, pp. 28, 57, 198, 199, 228, 229, 320, 460; Ref. 17, p. 1
	1000734	04/14/2010	TCE <i>cis</i> -1,2-DCE	6.74 2.47	0.5 0.5	
	5049-9	08/17/2010	TCE <i>cis</i> -1,2-DCE	6.2 2.2	0.50 0.50	
MDNR 124 ^a	1000736	04/14/2010	TCE	0.85	0.5	4, pp. 29, 57, 198, 199, 468, 1347, 1379, 1380; Ref. 17, p. 1
	1003720	09/15/2010	TCE	0.66	0.5	
	5049-8	08/17/2010	TCE	0.74	0.5	
MDNR 181 ^a	1003706	04/22/2010	TCE <i>cis</i> -1,2-DCE	4.14 1.29	0.5 0.5	4, pp. 30, 58, 612, 613, 620, 621; Ref. 17, p. 1
	5049-4	08/16/2010	TCE <i>cis</i> -1,2-DCE	4.5 1.4	0.5 0.5	
MDNR 251 ^a	1000571	06/15/2010	TCE <i>cis</i> -1,2-DCE	5.41 3.13	0.5 0.5	4, pp. 30, 58, 641, 687, 688, 783; Ref. 17, p. 1
	5049-1	08/16/2010	TCE <i>cis</i> -1,2-DCE	5.8 2.6	0.5 0.5	
	5049-15	08/17/2010	TCE <i>cis</i> -1,2-DCE	4.4 1.6	0.5 0.5	
No code	EPA sample 5049-15	08/17/2010	TCE <i>cis</i> -1,2-DCE	4.4 1.6	0.5 0.5	14, p. 17; 15, pp. 12, 13; 16, pp. 22 – 24

Notes:

^a Well codes are those used by MDNR

* TCE in this sampled is estimated and the result is biased low due to low recoveries of surrogate analytes (Ref. 15, p. 5)

J The identification of the analyte is acceptable; the reported value is an estimate (Ref. 15, p. 2)

** The reporting limits presented in the data packages are equivalent to sample quantitation limits (SQLs) (Ref. 17, p. 1)

DCE Dichloroethene

µg/L Micrograms per liter

TCA Trichloroethane

TCE Trichloroethene

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Samples collected by MDNR and EPA have shown that contaminants occur in ground water.

Containment Description	Containment Factor Value	Reference
Gas Release to Air:	Not scored	Not applicable
Particulate Release to Air:	Not scored	Not Applicable
Release to Ground Water: The containment factor value for the ground water migration pathway was evaluated for “All Sources” for evidence of hazardous substance migration from source area. Applicable containment factor value was determined based on existing analytical evidence of hazardous substances in ground water samples from public and private wells. Therefore, based on evidence of a release, the highest ground water migration pathway containment factor value of 10 was assigned as specified in Table 3-2 of the HRS Rule (Ref. 1, Section 3.1.2.1).	10	1, Section 3.1.2.1, Table 3-2;
Release through Overland Migration and/or Flood:	Not scored	Not Applicable

2.4.2 HAZARDOUS WASTE QUANTITY

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The information available is not sufficient to evaluate Tier A, as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Hazardous Waste Quantity proceeds to evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Section 2.4.2.1.1).

Hazardous Constituent Quantity Assigned Value: Not Scored

2.4.2.1.2. Hazardous Wastestream Quantity (Tier B)

The information available is not sufficient to evaluate Tier B. As a result, the evaluation of Hazardous Waste Quantity proceeds to evaluation of Tier C, volume (Ref. 1, Section 2.4.2.1.2).

Hazardous Wastestream Quantity Assigned Value: Not Scored

2.4.2.1.3. Volume (Tier C)

For the migration pathways, the source is assigned a value for volume using the appropriate Tier C equation from Table 2-5 (Ref. 1, Section 2.4.2.1.3). As measure by geographical information system (GIS), the approximate lateral extent of the plume is 636 acres. Because the vertical extent of the ground water plume is unknown, the volume for the ground water plume will be designated as unknown, but greater than zero.

Volume Assigned Value: > 0

2.4.2.1.4 Area (Tier D)

The area measure (Tier D) is not evaluated for source type “other” (Ref. 1, Table 2-5).

Area of source (ft²): Not evaluated
Area Assigned Value: Not evaluated

2.4.2.1.5. Source Hazardous Waste Quantity Value

As described in the HRS, the highest value assigned to the source from the four measures of hazardous waste quantity (Tiers A, B, C, and D) is assigned as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1.5). Thus, the source hazardous waste quantity value is unknown, but greater than zero.

Source 1 Hazardous Waste Quantity	
Tier Measure	Source Values
Tier A, Hazardous Constituent Quantity	NS
Tier B, Hazardous Wastestream Quantity	NS
Tier C, Volume	> 0
Tier D, Area	NS

Notes:

> Greater than\
NS Not scored

Highest assigned value assigned from Table 2-5: > 0; but unknown

SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Containment Factor Value by Pathway				
			Ground Water (GW) (Table 3-2)	Surface Water (SW)		Air	
				Overland/Flood (Table 4-2)	GW to SW (Table 3-2)	Gas (Table 6-3)	Particulate (Table 6-9)
1	> 0	No	10	NS	NS	NS	NS

Notes:

> Greater than
NS Not scored

Description of Other Possible Sources

MDNR and EPA have taken efforts to identify the source of the ground water contamination and have not located a definitive source to date. Five potential source areas have been identified and sampled; however, no clear source of the ground water contamination has been identified (Ref. 4, pp. 17, 18).

One possible source that was sampled was at the Compass Cleaners & Laundromat which operated in the Compass Plaza strip mall from approximately 2004 to 2007 (Ref. 4, pp.10, 42). Initially, dry cleaning services were subcontracted out to another location (Ref. 4, p.10). In December 2006, the business obtained dry cleaning equipment and provided the service on site (Ref. 4, p.10). An older model drycleaner machine was initially bought but was quickly traded for a machine that used a petroleum

solvent-based system (Ref. 4, pp 1484, 1486, 1488). The solvent tank was located inside the main building (Ref. 4, p.10). According to the former owner of the business, solvents used in the first dry cleaning machine were most likely a chlorinated solvent such as PCE (Ref. 4, p. 1488). As part of the SI/RSE activities, two subsurface borings were advanced on the southwest corner of the laundromat building as shown on Figure 2 of the SI/RSE report (Ref. 4, pp. 10, 42). Boring SB04 was located as near to the location of the solvent tank as practical (Ref. 4, pp. 10, 42, 50). Soil samples were collected from this location at 15.5 feet depth (slightly elevated photo ionization detector reading) and from 28 feet (refusal) (Ref. 4, p. 10). A replicate soil sample was collected at the 28 foot depth (Ref. 4, p. 10). Boring SB05 was located near the parking lot between the solvent tank and the Compass Plaza public well (Ref. 4, pp. 10, 42, 51). All soil samples were submitted to the department's laboratory for analysis of VOCs (Ref. 4, p. 10). Low levels of PCE were reported in soil boring SB04 (Ref. 4, pp. 15, 16, 1212, 1213, 1216, 1217). This area was resampled by EPA in May 2011 (Refs.34, pp.8, 11, 13; 35; 36, p. 3). The only chlorinated VOC detected in soils was PCE at a concentration of 30 µg/kg in sample 5367-4 (Ref. 36, pp. 8 – 22). This sample was collected from a depth of 6 to 7 feet below ground surface at the former Compass Plaza Laundromat (Ref. 35, p. 4). No TCE or *cis*-1,2-DCE were reported in soil sample 5367-4 (Ref. 36, pp. 8, 9). No other soil sample contained reportable levels of any chlorinated VOC (Ref. 36, pp. 2, 3, 8 – 23). Although PCE is known to degrade into TCE in the environment (Ref. 18, p. 8), this area of contaminated soil did not contain any TCE or *cis*-1,2-DCE (Ref. 36, pp. 3, 8 – 11).

Another potential source investigated is the Positronics Inc. facility, located approximately 0.75 mile east of the Compass Plaza well (Ref. 4, p. 42). The facility consists of a 0.6 acre main building in the southeast corner of the lot and an out-building located north of the middle of the main building (Ref. 4, p. 10). From 1975 until 1983, the property was owned and operated by Positronics, Inc, a company that manufactured electronic connectors, which involved electroplating (Ref. 4, p. 1387). They also used TCE in their manufacturing process (Ref. 4, p. 1490). Process water from the operation was stored in an on-site lagoon which then discharged to a sinkhole (Ref. 4, pp. 1389, 1390, 1399). In 1981, the facility prepared a plan to cease discharging to the sinkhole, and to begin applying the process water directly to the land into an irrigation field on site (Ref. 4, pp. 1390, 1391, 1400). The irrigation system began operating sometime between 1981 and 1987 (Ref. 4, pp. 1387, 1390). The facility closed due to a fire in 1983 (Ref. 4, p. 1387). In 1993, the lagoon contents were excavated, dewatered, and disposed of in a landfill. At some point after 1993, the lagoon was filled in with asphalt and concrete debris (Ref. 4, p. 11).

The Positronics facility was discovered and entered into CERCLIS in November 1986 with a CERCLIS Identification number of MOD007447196 (Ref. 7, p. 1). MDNR conducted a Preliminary Assessment (PA) on the property in 1987 and a SI in 1989 (Ref. 4, pp. 1387, 1422). The focus of those investigations was potential contamination from the nickel, copper, and chromium used in the plating process. However, chlorinated solvents were detected in composited shallow soil samples collected in the irrigation field (Ref. 4, pp.1430, 1539; Ref. 6, pp. 13, 18). The SI report recommended a Health Assessment and a dye trace study (Ref. 4, p. 1433). The Positronics site was archived in January 1994 and un-archived in March 2010 (Ref. 7, p. 1)

Three businesses currently operate at the property that was once Positronics: Greenview Manufacturing, Fairchild Industries, and Ozark Mountain Concepts. None are known to use or have used chlorinated solvents (Ref. 4, p. 11).

Four soil boring locations were sampled on July 27, 2010 as part of the MDNR SI/RSE in the Positronics area (Ref. 4, p. 10, 11, 15). Figure 2 of the SI/RSE report shows the locations of the samples collected (Ref. 4, p. 42). One soil boring location was located at the southern tip of the former lagoon location, northwest of the storage shed along the grass line (Ref. 4, pp. 11, 42, 51). Soil samples were collected from 24.5 feet and from 31 feet. The other three soil boring locations were advanced in the irrigation field area. Soil samples were collected from a 1.5 foot depth at each location (Ref. 4, pp. 11, 42, 52). All

samples were submitted to the department's laboratory for VOC analysis (Ref. 4, pp. 1176-1189). No chlorinated solvents were found in the soil samples submitted for analysis (Ref 4, pp. 15, 16, 42, 1168, 1184, 1226 – 1244).

Due to the unique flow characteristics of the upper karst aquifer, tracking a ground water plume to a source is difficult. Dye trace studies are proposed for the sinkhole at the former Positronics facility to gain a better understanding of the flow characteristics of the aquifer. In addition, soil sampling at the sinkholes is proposed to see if one or more of these features may be contributing to the ground water contamination. Speculation exists that unauthorized dumping/burial, or disposal of drummed waste may have occurred in the Rogersville area (Ref .31). This has yet to be confirmed.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Regional Setting

The Compass Plaza Well site lies on the eastern border of the Springfield Plateau of the Ozark Plateau sub-province of the Interior Highlands physiographic province in Missouri (Ref. 8, p. 1). This area is characterized by rolling upland hills with low relief (Ref. 8, p. 1). Surface elevations at the site are about 1,463 feet above mean sea level. Mississippian –age limestone lies beneath the site at a depth of about 30 to 35 feet and includes the Springfield Plateau Aquifer that produces up to 50 gallons per minute and is known to provide water for numerous domestic wells. The Mississippian age rocks of the Springfield Plateau aquifer are 120 to 130 feet thick at the site (Ref. 8, pp. 1, 3, 29). Depth to water is about 100 feet below ground surface (Ref. 8, p. 3). The Springfield Plateau Aquifer is underlain by the Ozark Confining unit which is roughly 30 feet thick regionally (Ref. 8, pp. 1, 3, 29). This confining unit forms a leaky aquitard that separates the Springfield Plateau and underlying Ozark aquifer (Ref. 8, p. 1). The Ozark Aquifer consists of Ordovician- and Cambrian-age dolomite and sandstone (Ref. 8, pp. 2, 29). This aquifer is widely used regionally and produces up to 500 gallons per minute (Ref. 8, p. 2). The regional thickness of the aquifer is about 1,600 feet (Ref. 8, pp. 4, 29). The Ozark aquifer is underlain by the St. Francois Confining unit which consists of 90 feet of alternating argillaceous (clay) dolomite and shale that are Cambrian aged (Ref. 8, pp. 2, 4, 29).

This area is characterized as karstic terrain. Dissolved limestone bedrock has caused many mapped sinkholes and 14 springs near the site. In addition to the karstic terrain, the Pearson Fault system aligns with the site and is mapped to within 4 miles of the site to the northwest (see Figure 3 of this documentation record). The fault system has 10 to 20 feet vertical offsets that may lead to inter-connectivity of the shallow Springfield Plateau Aquifer and the deeper Ozark aquifer (Ref. 8, pp. 3, 5, 8).

Ground Water Migration Pathway Description

Post-Mississippian System

Soils west of Rogersville are of the Wilderness-Viraton association (Ref. 9, p. 5). This association is characterized by deep, moderately well drained, gently sloping soils on uplands and terraces (Ref. 9, p. 5). The predominant soil type in the area is the Needleeye silt loam (Ref. 10, p. 3). The Needleeye series consist of deep, moderately well drained soils on uplands (Ref. 9, p. 4). These soils formed in a thin mantle of loess or other loamy material and clayey residuum weathered from cherty limestone (Ref. 9, p. 4). Needleeye silt loam is acidic to neutral (pH 3.6 to 7.3) and hydraulic conductivity is roughly 1.4×10^{-3} to 4.2×10^{-5} centimeters per second (cm/sec) (Ref. 4, pp. 18, 19).

The unconsolidated sediments range in thickness from 30 to 35 feet near the site (Ref. 8, p. 2). The regolith, or unconsolidated material above competent bedrock, is comprised of bedrock residue from chemical weathering and windblown clay. The result is a red, silty clay that contains limestone and chert cobbles at depth (Ref. 8, p. 2). Usable ground water is not known to occur in the overburden.

Stratigraphic unit descriptions are based on logged wells located near the site (Ref. 8, p. 2). The table below lists the geohydrologic properties (thickness, lithology, nature of porosity and permeability, hydraulic conductivity, and hydrologic unit) of the strata beneath the site.

AQUIFER, STRATIGRAPHY, AND HYDROLOGY OF THE COMPASS PLAZA WELL TCE						
System	Stratigraphic Unit	Thickness (feet)	Lithology	Nature of Porosity and Permeability	Hydraulic Conductivity (cm/sec)	Hydrologic Unit
Post Mississippian	Soil and Regolith	30 - 35	Cherty, silty clay	Intergranular space throughout matrix with exception of clay; Moderate permeability	1.4×10^{-3} - 4.2×10^{-5}	None
Mississippian	Burlington-Keokuk Limestones, Elsey-Reeds Spring Formation, and Pierson Limestone	120 - 130	Cherty, coarse-grained, fossiliferous limestone	Limestone bedding separations, fractures, and dissolution features; High permeability	7.8×10^{-3}	Springfield Plateau Aquifer
	Chouteau Group (Northview and Compton Limestone Formations)	27 - 30	Argillaceous limestone and shale	Bedding separations, fractures, and possible dissolution features; Moderately low permeability	1×10^{-5} - 5×10^{-6}	Ozark Confining Unit
Ordovician	Cotter and Jefferson City Dolomites, Roubidoux Formation, and Gasconade Dolomite	approx. 1,600	Dolomite, cherty dolomite, sandstone, dolomitic sandstone, argillaceous dolomite, and minor shales	Bedding separations and fractures; Moderate permeability	1×10^{-4} - 1×10^{-5}	Ozark Aquifer
Cambrian	Eminence and Potosi Dolomites					
	Derby-Doe Run Dolomites	90	Medium-crystalline dolomite with beds of silt, shale, and sand	Bedding separations and fractures; Low permeability	1×10^{-8}	St. Francois Confining Unit

Source: Ref. 8, p. 29

Mississippian System

The uppermost bedrock units are of Osagean Series of the Mississippian System (Refs. 11, pp. 5, 16, 18; 12). The Mississippian-age rocks beneath the site are divided (from youngest to oldest) into the Burlington Limestone and Reeds Spring-Elsey, and Pierson Formations (Refs. 8, p. 3; 11, p. 5; 12). These formations consist of fossiliferous limestone and chert (Ref. 8, p. 3). The Mississippian-age rocks in the Springfield Plateau aquifer beneath the site range from approximately 120 to 130 feet thick (Ref. 8, p. 3). Due to the acid solubility of limestone, the shallow bedrock is deeply dissolved (karst). The dissolution leads to an uneven bedrock surface with cutters and pinnacles along with cave and sinkhole formation (Ref. 8, p. 3). Based upon topographic maps, there are many sinkholes lie near the site (Ref. 8, p. 5). There are also 14 springs near the site (Ref. 8, p. 5). Based upon this information and the limestone bedrock, the site lies within a karst area (Ref. 8, p. 5).

The Ozark confining unit makes up the deepest and oldest Mississippian-age rocks beneath the site consisting of the Northview and Compton Limestone Formations (Ref. 8, p. 3). These formations are both in the Chouteau Group (Ref. 8, p. 29). These formations are composed of argillaceous (silty) limestone (Ref. 8, p. 3). The Compton Limestone and Northview Formation are roughly 30 feet thick beneath the site and form an effective barrier to the underlying Ozark Aquifer where they are not compromised by faults or open boreholes (Ref. 8, p. 3).

Ordovician and Cambrian Systems

Underlying the Mississippian age formations are primarily dolomites of Ordovician and late Cambrian age (Ref. 8, p. 29). These formations described below make up the Ozark Aquifer. The Ozark aquifer consists of the Ordovician- and Cambrian-age rocks beneath the site divided into the Jefferson City/Cotter Dolomite, Roubidoux Formation, and Gasconade Dolomite formations (Ref. 8, p. 4). These formations consist dominantly of dolomite and cherty dolomite with occasional sandstone and cherty sandstone beds (Ref. 8, p. 4). The Ordovician-age rocks beneath the site are roughly 1,000 feet thick. The Cambrian-age Eminence and Potosi Dolomites consist of medium- to coarsely crystalline dolomite with nodular chert (Ref. 8, p. 4). The Cambrian-age rocks beneath the site are 550 feet thick (Ref. 8, p. 4).

Below the formations encompassing the Ozark aquifer are the Davis Formation (known as the St. Francois Confining Unit) and the Bonneterre Dolomite and Lamotte-Regan Sandstone formations (Refs. 8, pp 4, 29; 11, p. 5). The latter two formations encompass the St. Francois aquifer (Ref. 11, p. 5). The St. Francois aquifer is not known to be used near the site (Ref. 8, pp 4, 29).

Regional Aquifers

The site is located in the Springfield Plateau ground water province in Missouri which covers all or parts of 27 counties in southwestern and west-central part of the state (Ref. 11, pp. 4, 6). Thick dolomites and sandstones comprising the St. Francois, Ozark, and Springfield Plateau aquifers underlie the region (Ref. 11, p. 4, 6). The state has identified 573 registered wells near the site (Ref. 8, pp 1, 9 - 28). These wells are shown on Figure 1 of reference 8 (Ref. 8, p. 7) and reported construction details are presented in Table 1 of reference 8 (Ref. 8, pp. 9 – 28). Table 1 shows the database where the well registration is kept, the well identification number, the total depth of the well, the footage of casing, the elevation of the well, the reported static water level at the well, date installed, use, owner of the well at the time of registration and the aquifer, or aquifers it draws from (Ref. 8, pp. 9 – 28). Prior to 1987, registry of private wells was not required, so some existing older wells may not be included and the number of private wells may be greater than the 573 reported (Ref. 8, p. 2).

Springfield Plateau Aquifer: The first aquifer encountered beneath the site is the Springfield Plateau Aquifer which is reported at a depth of 100 feet bgs (Ref. 8, p. 3). The aquifer consists of a sequence of cherty limestones of Mississippian age (Ref. 8, p. 3). The lowest formation in the aquifer is the Pierson Limestone, which is considered by some to belong to the Ozark confining unit (Ref. 11, pp. 5, 7). This aquifer produces up to 50 gallons per minute (Ref. 8, p. 1). The Springfield Plateau is an unconfined karstic aquifer (Ref. 8, p. 3; 11, p. 18). The Springfield Plateau Aquifer is known to provide water for 259 of the 573 wells near the site (Ref. 8, p. 1). Based on the reported depth to ground water of 100 feet below ground surface and the reported depth to the bottom of the aquifer of between 150 and 165 feet below ground surface, this aquifer ranges from roughly 50 to 65 feet thick beneath the site (Ref. 8, pp. 3, 29). Water reportedly moves westward through the Springfield Plateau Aquifer (Refs. 8, p. 3; 11, p. 18). A dye trace study by the state showed movement to the south southeast (Ref. 4, pp. 32, 46). The hydraulic conductivity of the Springfield Plateau Aquifer is roughly 7.8×10^{-3} centimeters per second (cm/sec) (Ref. 8, p. 3). Due to the karst nature, permeability and flow gradient characteristics may vary over short distances (Ref. 8, p. 3).

The Ozark Confining Unit is roughly 30 feet thick at Rogersville (Ref. 12, p. 1). This confining unit forms a leaky aquitard that separates the Springfield Plateau and Ozark aquifers (Ref. 8, pp. 1, 3, 5). This confining unit consists of Mississippian-age limestone and shale referred to as the Northview and Compton Limestone Formations and has a hydraulic conductivity of 1.0×10^{-5} to 5.0×10^{-6} cm/sec. (Ref. 8, pp. 3-4, 29).

Approximately 45% of the recorded wells near the site have open boreholes connecting the Springfield Plateau Aquifer with the underlying Ozark Aquifer (Ref. 8, pp. 1, 2). Also, the Pearson Fault System is mapped to within four miles of the site (Ref. 8, pp. 2, 8; also see Figure 3 of this documentation record). This fault system is comprised of several en-echelon faults with individual offsets of 10 to 20 feet (Ref. 8, p. 2). Within the fault zone, there is sufficient offset to allow interconnection between aquifers. Near the site, 568 wells penetrated the Ozark Confining unit. Of these wells, 314 are cased through the confining unit (Ref. 8, p. 2).

Ozark Aquifer: Water infiltration from the Springfield Plateau aquifer through the Ozark confining unit is one way the Ozark aquifer is recharged (Ref. 11, pp. 14, 15). The Ozark aquifer consists of the Ordovician- and Cambrian-age rocks beneath the site divided into the Jefferson City/Cotter Dolomite, Roubidoux Formation, and Gasconade Dolomite formations. These formations consist dominantly of dolomite and cherty dolomite with occasional sandstone and cherty sandstone beds (Ref. 8, p. 4). The Ordovician-age rocks beneath the site are roughly 1,000 feet thick. The Cambrian-age Eminence and Potosi Dolomites consist of medium- to coarsely crystalline dolomite with nodular chert (Ref. 8, p. 4). The Cambrian-age rocks beneath the site are 550 feet thick (Ref. 8, p. 4). The Ozark Aquifer has a hydraulic conductivity that ranges from 1.0×10^{-4} to 1.0×10^{-5} cm/sec. (Ref. 8, p. 4).

Aquifer Interconnections

Information about the geology suggests the Springfield Plateau Aquifer and Ozark Aquifer are interconnected. This interconnection is based on the following information:

- As documented in Section 3.1.1 of this documentation record, TCE was initially detected in three wells referred to as the Compass Plaza well, Citizen's Bank of Rogersville well, and the Jamestown Irrigation well (Ref. 4, pp. 5, 41). The Compass Plaza well has steel casing that is 263 feet long, a total depth of 750 feet and a pump which is set at 465 feet (Ref. 23). The Citizen's Bank of Rogersville well has steel casing that is 260 feet long, a total depth of 545 feet and a pump which is set at 360 feet (Ref. 24). The Jamestown Irrigation well has steel casing that is 210 feet long, a total depth of 600 feet and a pump which is set at 460 feet (Ref. 25). All three

wells are cased through the Ozark confining unit and draw from the Ozark aquifer (Ref. 8, p. 29). These wells provide evidence that TCE has migrated to the Ozark aquifer.

- Two of the domestic wells samples by MDNR and EPA are completed and draw exclusively from the lower Ozark aquifer and have been shown through analytical evidence to contain TCE indication contamination has migrated across the confining unit. The domestic wells with state well identification numbers of 0273248A and 0090275A reportedly draw from the Ozark aquifer exclusively (Ref. 8, pp. 9, 10). As documented in Section 3.1.1 these wells with MDNR designations of 102 and 121 contain TCE indicating contamination has migrated through the Ozark confining unit (Ref. 4, p. 57).
- Approximately 254 of the 573 recorded and registered wells near the site have open (uncased) boreholes connecting the Springfield Plateau Aquifer with the underlying Ozark Aquifer (Ref. 8, pp. 1, 2). Of these, 71 are reported to be open hole completions drawing from both the Springfield Plateau and Ozark aquifers within approximately 2-miles of the site (Ref. 8, pp. 9 – 14). In these wells that are registered with the state, casing lengths range from five feet long (Ref. 8, p. 10) to 130 feet long (Ref. 8, p. 12). Prior to 1987, registry of private wells was not required (Ref. 8, p. 2). Registered domestic wells installed before 1970, typically have casing lengths of less than 50 feet and draw from both aquifers (Ref. 8, pp. 9, 10, 15, 21). Therefore, older domestic unregistered wells within two miles are likely of open hole construction and draw from both aquifers.
- The 30 foot thick Ozark Confining unit is described by the Missouri Geological Survey Program, Division of Geology and Land Survey as being a leaky aquitard (Ref. 8, p. 1), and that the Ozark aquifer is recharged to a large extent from the Springfield Plateau aquifer (Ref. 11, pp. 14, 15).

SUMMARY OF AQUIFER(S) BEING EVALUATED

Aquifer No.	Aquifer Name	Is Aquifer Interconnected with Surficial Aquifer within 2 miles? (Y/N/NA)	Is Aquifer Continuous Within 4-mileTDL? (Y/N)	Is Aquifer Karst? (Y/N)
1	Springfield Plateau Aquifer	NA	Yes	Yes
2	Ozark Aquifer	Yes	Yes	No

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Direct Observation:

An observed release by direct observation is not scored.

Chemical Analysis:

As documented below, an observed release to the ground water migration pathway in the combined Springfield Plateau and Ozark aquifer has been established. This is based on analysis of ground water collected from private, irrigation and community drinking water wells with open hole construction across both aquifers.

The well that serves the Compass Plaza is located behind the buildings in Compass Plaza and is located most closely to the former Compass Cleaners & Laundromat (Ref. 4, pp. 5, 41, 44, 48). The well, constructed in 2004, has a total depth of 750 feet and draws water from the Ozark Aquifer (Refs. 4, p. 7; 23). Prior to the summer of 2009, the Compass Plaza well was considered a non-community transient water supply (Ref. 4, p. 7). A non-community transient water supply is defined as serving an average of at least 25 individuals daily at least 60 days out of the year, and is not required under Missouri regulations to conduct extensive chemical testing (Ref. 4, p. 7). In the spring of 2009, the Graceland Daycare connected to the Compass Plaza well which changed the status of the well from a transient to a non-transient water supply (Ref. 4, p. 7). A non-transient non-community well is defined as a public water system that is not a community water system that regularly serves at least 25 of the same persons over 6 months per year (Ref. 4, p. 7). Non-transient non-community wells are required to conduct periodic chemical testing. The first such testing was conducted on June 18, 2009 (Ref. 4, p. 7). TCE was detected at 3.73 µg/L (Ref. 4, pp. 7, 62, 63). The Compass Plaza well was disconnected on September 29, 2010 (Ref. 4, pp. 7, 1555). The Compass Plaza development is now served by water supplied by the City of Rogersville Public Water System (Ref. 4, p. 7).

Following the initial detection of TCE in the Compass Plaza public well in June 2009, successive rounds of sampling were conducted by MDNR beginning with wells nearest Compass Plaza and extending outward (Ref. 4, p. 25). Sampling plans prepared for the domestic well sampling events are provided in the appendix of the SI/RSE report (Ref. 4, pp. 1499-1505, 1514-1524, 1538-1543). Ground water samples collected by MDNR were analyzed by the state's environmental laboratory within the Environmental Services Program by EPA safe drinking water act method 524.2 for volatile organic compounds. (Ref. 4, pp. 26, 1503). Seven public drinking water wells located nearest the site were sampled on a number of occasions between March and July 2010 (Ref. 4, p. 25). These wells are shown in Figure 5 of the SI/RSE report (Ref. 4, p. 45). These wells are also provided on Figures 2 and 3 of this documentation record.

Private wells located near the site were identified using well records from MDNR Division of Geology and Land Survey (DGLS) databases. Additional wells were added to the sampling program based on requests by private residents following a public meeting held in Rogersville on May 25, 2010. In all, access was gained to 121 private drinking water wells, and these were sampled over the period between March, April and September of 2010 (Ref. 4, p. 26). The list of sampled private wells is included in Table C1 of the SI/RSE report (Ref. 4, pp. 57 -59). Figure 5 of the SI/RSE report shows all public and private well sampling locations (Ref. 4, p. 45).

During initial rounds of sampling, samples were collected only from outside taps nearest the wellhead. Subsequent rounds of sampling also included sample collection at an inside tap (typically the kitchen). Duplicate samples were collected, and trip blanks processed as specified in the Quality Assurance Project Plan (QAPP) (Ref. 4, p. 26). All samples were submitted to the department's Environmental Services Program (ESP) laboratory for analysis of VOCs by EPA drinking water method 524.2 (Ref. 4, p. 26). The analytical data were validated by Tetra Tech (Ref. 17). The reporting limits presented in the data packages are equivalent to sample quantitation limits (SQLs) (Ref. 17, p. 1).

In the summer of 2010, MDNR requested that EPA Region 7 to provide alternative water supply to households drinking contaminated ground water (Ref. 4, p. 1557-1558). EPA Region 7 tasked the START contractor to provide removal assessment support by resampling State identified contaminated wells and also perform post filtration sampling at wells where wholehouse filtration systems were to be installed (Ref. 13, pp. 5, 11, 13). Samples were collected August 16 and 17, 2010 and post filtration samples were collected August 25, 2010 (Ref.14).

Chlorinated solvents reported by both EPA and MDNR in private wells include TCE, 1,1,2-trichloroethane (TCA), and *cis*-1,2-dichloroethene (DCE) (Refs.4, pp. 28, 29, 30; 15, pp. 3, 10, 11). The locations of the wells sampled are shown on Figure 5 of the SI/RSE report (Ref. 4, p 45). The following pages further discuss background concentration and release samples used in establishing an observed release by chemical analysis.

Background Concentrations:

The MDNR performed multiple rounds of public and private water well samples. Initial sampling was conducted by the MDNR's PDWB and focused on public wells (Ref. 4, pp. 4, 7). After several rounds of sampling public wells, the site was referred to the MDNR HWP in March 2010 for further assessment under CERCLA (Ref. 4, pp. 4, 7). Ground water sampling by the HWP included public and private drinking water wells (Ref. 4, pp. 25, 26). Access was gained by the HWP to 121 private drinking water wells which were sampled between March and September of 2010 (Ref. 4, p. 26). Chlorinated solvents were reported by the State in 12 of the 121 wells sampled (Ref. 4, pp. 28 – 30).

Initial sampling by the PDWB in June, July and September of 2009 did not include background well sampling (Ref. 4, pp. 62 – 67). Only the well associated with Compass Plaza is known to have been sampled in 2009. On March 8, and 16, 2010 additional public water supply wells were sampled including the Compass Plaza well (Ref. 4, pp. 68, 92), City of Rogersville well 4 (Ref. 4, p. 70), City of Rogersville well 1 (Ref. 4, p. 72), Citizens Bank of Rogersville well (Ref. 4, pp. 74, 90), Bills Quick Mart well (Ref. 4, p. 76), Logan Rogersville Middle School well (Ref. 4, p. 80), Logan Rogersville High School well (Ref. 4, p. 82), Logan Rogersville Primary School well (Ref. 4, p. 84), Willow Green Gardens Tree Farm well (Ref. 4, p. 86), and the Jamestown Irrigation well (Ref. 4, p. 94). Samples were analyzed for VOCs using EPA method 524.2 (Ref. 4, pp. 70-87).

Later sampling by the state HWP did consider background sampling. The HWP designated three wells as background as part of their investigation (Ref. 4, pp. 30, 57, 58). These wells were designated as well 162, 163 and 179 (Ref. 4, pp. 30, 57, 58). The inset of Figure 5 of the SI/RSE report shows two of the wells to be west of Rogersville and the third to be east of Rogersville (Ref. 4, p. 45). It appears these wells were sampled one time in April of 2010 (Ref. 4, p. 30). Samples were analyzed for VOCs using EPA method 524.2 (Ref. 4, p. 197). No information was provided on well depths for any of the background wells sampled by the HWP. Although these three wells were designated as background, there are many other wells that were sampled during the SI/RSE evaluation that did not contain TCE, *cis*-1,2-DCE or 1,1,2-TCA. Figure 5 of the SI/RSE report (Ref. 4, p. 45) shows most of the private wells sampled. On that map only the wells shaded red or orange contained measurable levels of TCE, all others shown did not contain TCE (Ref. 4, pp. 26 – 30, 45).

Initial sampling by EPA occurred in August 2010 in accordance with the QAPP dated August 13, 2010 (Refs. 13, 14). Initial sampling by EPA was at private wells where contamination was found previously by MDNR as well as several other private wells located near the area of known contamination (Ref. 13, pp. 5, 13). In addition, post filtration samples were collected from homes with newly installed whole-house filtration systems (Refs. 13, pp. 5, 13; 14, pp. 12, 14, 16, 18, 19, 21). These samples were analyzed for VOCs under the EPA contract lab program (CLP) using EPA Region 7 Method 3230.09, which meets the requirements of EPA Method 524.2 (Refs. 13, p. 8; 14, pp. 3-24; 15, p. 4; 16; 39, p. 1). Of the wells sampled, one well at 10118 East Farm Road 186, was shown to be free of TCE contamination and is selected as background. This well was also sampled by the state of Missouri and is listed as MDNR location ID 177 (Refs. 4, pp. 45, 57; 14, p. 22; 15, p. 3, 15). No information was available pertaining to the depth of the well.

The locations of all background wells in relation to the ground water plume are shown on Figure 3 of this documentation record. Known information about the depths of the wells is presented in the table on the following page.

BACKGROUND WELL INFORMATION

Well Code ^a	Screened Interval* (ft bgs)	Well Depth (ft bgs)	Well Depth (ft amsl)	Year Drilled	References
162	Not Reported	Not Reported	Unknown	Not Reported	4, pp. 196 – 200, 214, 483 - 486
163	Not Reported	Not Reported	Unknown	Not Reported	4, pp. 196 – 200, 214, 487 - 490
179	Not Reported	Not Reported	Unknown	Not Reported	4, pp. 196 – 200, 216, 560 - 563
Rogersville W1	175 – 1,260	1,260	221	1954	20, p. 2; 37, p. 1; 38, pp. 1, 3
Rogersville W4	450 – 1,150	1,150	unknown	1996	20, p. 2;
Bills Quick Mart well	200 - 600	600	unknown	1984	26, p. 3
Logan Rogersville Middle School well	350 – 685	685	738	1967	27
Logan Rogersville High School well	358 – 1,005	1,005	415	2004	28
Logan Rogersville Primary School well	257 - 758	758	668	1956	29
Willow Green Gardens Tree Farm well	197 - 810	810	unknown	2000	30
177 (EPA sample 5049-20)	Not Reported	Not Reported	Unknown	Not Reported	4, pp. 45, 57; 14, p. 22

Notes:

^a Well codes for private wells sampled by MDNR HWP are explained in reference 4, pp. 57, 58, 59.

* Wells in the Springfield plateau typically consist of an unlined, open borehole below the casing (Ref. 11, pp. 21 - 24).

ft bgs Feet below ground surface

ft amsl Feet above mean sea level

NA Not available

BACKGROUND CONCENTRATIONS

Well Code ^a	Laboratory Number	Sample Date	Contaminant	Contaminant Concentration (µg/L)	Reporting Limit (µg/L)	References
162	1000740	04/14/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 196 – 200, 214, 483 – 486; 17, p. 1
163	1000741	04/14/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 196 – 200, 214, 487 – 490; 17, p. 1
179	1000441	04/15/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 196 – 200, 216, 560 – 563; 17, p. 1
Rogersville WL1	AB15914	03/08/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 72, 73, 163
Rogersville WL4	AB15913	03/08/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 70, 71, 163
Bills Quick Mart	AB16162	03/16/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 76, 77
Logan Rogersville Middle School	AB16164	03/16/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 80, 81
Logan Rogersville High School	AB16165	03/16/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 82, 83, 166
Logan Rogersville Primary School	AB16166	03/16/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 84, 85, 167
Willow Green Gardens Tree Farm	AB16167	03/16/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, pp. 86, 87, 168
177	5049-20	08/25/2010	TCE <i>cis</i> -1,2-DCE 1,1,2-TCA	ND ND ND	0.5 0.5 0.5	4, p. 57; 14, pp. 2, 22; 15, pp. 2, 3, 14, 15; 16, pp. 30 - 32

Notes:

^a Well codes are explained in reference 4, pp. 57, 58, 59.

µg/L	Micrograms per liter
DCE	Dichloroethene
ND	Not detected
TCA	Trichloroethane
TCE	Trichloroethene

Contaminant Concentrations:

Contaminated samples documenting the observed release were collected from private and public drinking water wells. Well information such as screening interval, well depth, and year drilled was not available for most of the private wells because they were not registered with the State of Missouri, current owners did not know the depths of wells, or investigators failed to collect the information.

CONTAMINATED WELL INFORMATION

Well Code ^a	Screened Interval * (ft bgs)	Depth (ft bgs)	Depth (ft amsl)	Year Drilled	References
Compass Plaza Well	263 - 750	750	unknown	2004	23
Citizen's Bank of Rogersville	260 - 545	545	935	2001	24
Jamestown Irrigation well	210 - 600	600	unknown	2008	25
MDNR 176	Not Reported	Not Reported	unknown	unknown	4, pp. 29, 57, 198, 199
MDNR 168	Not Reported	Not Reported	unknown	unknown	4, pp. 29, 57, 198, 199
MDNR 170	Not Reported	Not Reported	unknown	unknown	4, pp. 29, 57, 199
MDNR 102	168 - 522	522	908	2001	4, pp. 28, 57, 198; 8, p. 9
MDNR 104	Not Reported	Not Reported	unknown	unknown	4, pp. 28, 57, 198, 199
MDNR 118	Not Reported	Not Reported	unknown	unknown	4, pp. 29, 57, 198, 199
MDNR 121	147 - 405	405	1045	1993	4, pp. 29, 57, 198, 199; 8, p. 10
MDNR 117	Not Reported	Not Reported	unknown	unknown	4, pp. 29, 57, 198, 199
MDNR 114	Not Reported	Not Reported	unknown	unknown	4, pp. 28, 57, 198, 199
MDNR 124	Not Reported	Not Reported	unknown	unknown	4, pp. 29, 57, 198, 199
MDNR 181	Not Reported	Not Reported	unknown	unknown	4, pp. 30, 58, 198, 199
MDNR 251	Not Reported	Not Reported	unknown	unknown	4, pp. 30, 58, 198, 199
No code EPA sample 5049-15	Not Reported	~400	unknown	1976	14, p. 17; 19, p. 10

Notes:

* Wells in the Springfield plateau typically consist of an unlined, open borehole below the casing (Ref. 11, pp. 21 - 24).

^a Well codes are explained in reference 4, pp. 57, 58, 59.

ft bgs Feet below ground surface

ft amsl Feet above mean sea level

CONTAMINATED WELL SAMPLE CONCENTRATIONS

Well Code^a	Laboratory Number	Sample Date	Contaminant	Contaminant Concentration (µg/L)	Method Reporting Limit (µg/L)	References
Compass Plaza Well	AB15892	03/08/2010	TCE <i>cis</i> -1,2-DCE	3.07 1.07	0.5 0.5	4, pp. 28, 68, 69, 165; 17, p. 1
	AB16170	03/16/2010	TCE <i>cis</i> -1,2-DCE	3.84 1.21	0.5 0.5	4, pp. 28, 92, 93, 170; 17, p. 1
Citizen's Bank of Rogersville	AB15915	03/08/2010	TCE <i>cis</i> -1,2-DCE	2.25 0.66	0.5 0.5	4, pp. 74, 75, 163; 17, p. 1
	AB16169	03/16/2010	TCE <i>cis</i> -1,2-DCE	2.11 0.69	0.5 0.5	4, pp. 90, 91; 17, p. 1
Jamestown Irrigation well	AB16171	03/16/2010	TCE <i>cis</i> -1,2-DCE	4.96 1.84	0.5 0.5	4, pp.28, 94, 95, 169; 17, p. 1
176	1000438	04/15/2010	TCE 1,1,2-TCA	313 0.84	0.5 0.5	4, pp. 29, 57, 198, 199, 550, 551, 604, 605, 618, 619; Ref. 17, p. 1.
	1003701	04/22/2010	TCE 1,1,2-TCA	323 0.83	0.5 0.5	
	5049-11	08/17/2010	TCE	180	6.3	14, p.13; 15, pp. 10, 11; 16, p. 18
168	1000747	04/15/2010	TCE	1.10	0.5	4, pp. 29, 57, 198, 199, 512, 572, 1327, 1377, 1378; Ref. 17, p. 1.
	1003692	04/21/2010	TCE	1.33	0.5	
	1003715	09/13/2010	TCE <i>cis</i> -1,2-DCE	1.41 0.5	0.5 0.5	
	5049-3	08/16/2010	TCE	1.1	0.5	4, p. 57; 14, p.5; 15, pp. 6, 7; 16, p. 5
170	1000750	04/15/2010	TCE <i>cis</i> -1,2-DCE	2.27 0.83	0.5 0.5	4, pp. 29, 57,198, 199, 524, 581, 582; Ref. 17, p. 1.
	1003697	04/21/2010	TCE <i>cis</i> -1,2-DCE	2.32 0.92	0.5 0.5	
	5049-5	08/16/2010	TCE <i>cis</i> -1,2-DCE	1.2 0.58	0.5 0.5	14, p.7; 15, pp. 8, 9; 16, pp. 7, 8
102	1000689	03/30/2010	TCE <i>cis</i> -1,2-DCE	5.41 1.91	0.5 0.5	4, pp. 28, 57, 198, 199, 234, 235, 378, 404; Ref. 17, p. 1
	1000720	04/14/2010	TCE <i>cis</i> -1,2-DCE	5.44 2.03	0.5 0.5	
	5049-18	08/17/2010	TCE <i>cis</i> -1,2-DCE	5.4 1.8	0.5 0.5	14, p.20; 15, pp. 14, 15; 16, pp. 27 - 29
104	1000724	04/14/2010	TCE	0.89	0.5	4, pp. 28, 57, 198, 199, 420, 1366, 1381, 1382; Ref. 17, p. 1
	1003725	09/15/2010	TCE <i>cis</i> -1,2-DCE	1.26 0.65	0.5 0.5	
	5049-7	08/16/2010	TCE	1.1 J*	0.5	14, p. 9; 15, pp. 5, 8, 9; 16, pp. 10, 11

CONTAMINATED WELL SAMPLE CONCENTRATIONS (Continued)

Well Code ^a	Laboratory Number	Sample Date	Contaminant	Contaminant Concentration (µg/L)	Method Reporting Limit (µg/L)	References
118	1003785	03/31/2010	TCE <i>cis</i> -1,2-DCE	4.79 1.61	0.5 0.5	4, pp. 29, 57, 198, 199, 238, 239, 390, 424; Ref. 17, p. 1
	1000725	04/14/2010	TCE <i>cis</i> -1,2-DCE	5.19 1.8	0.5 0.5	
	5049-13	08/17/2010	TCE	1.3	0.5	14, p.15; 15, pp. 12, 13; 16, pp. 19 - 21
121	1003790	03/31/2010	TCE	0.65	0.5	4, pp. 29, 57, 198, 199, 236, 237, 342, 444; Ref. 17, p. 1
	1000730	04/14/2010	TCE	0.97	0.5	
	5049-6	08/16/2010	TCE	0.66	0.5	14, p.8; 15, pp. 8, 9; 16, pp. 8 - 10
117	1003784	03/30/2010	TCE <i>cis</i> -1,2-DCE	3.57 1.28	0.5 0.5	4, pp. 28, 57, 198, 199, 238, 239, 386, 456; Ref. 17, p. 1
	1000733	04/14/2010	TCE <i>cis</i> -1,2-DCE	2.9 1.36	0.5 0.5	
	1003781	03/30/2010	TCE <i>cis</i> -1,2-DCE	6.36 2.7	0.5 0.5	4, pp. 28, 57, 198, 199, 228, 229, 320, 460; Ref. 17, p. 1
114	1000734	04/14/2010	TCE <i>cis</i> -1,2-DCE	6.74 2.47	0.5 0.5	
	5049-9	08/17/2010	TCE <i>cis</i> -1,2-DCE	6.2 2.2	0.50 0.50	14, p. 11; 15, pp. 10, 11; 16, pp. 13, 14
124	1000736	04/14/2010	TCE	0.85	0.5	4, pp. 29, 57, 198, 199, 468, 1347, 1379, 1380; Ref. 17, p. 1
	1003720	09/15/2010	TCE	0.66	0.5	
	5049-8	08/17/2010	TCE	0.74	0.5	14, p. 10; 15, pp. 8, 9; 16, pp. 11 - 13
181	1003706	04/22/2010	TCE <i>cis</i> -1,2-DCE	4.14 1.29	0.5 0.5	4, pp. 30, 58, 612, 613, 620, 621; Ref. 17, p. 1
	5049-4	08/16/2010	TCE <i>cis</i> -1,2-DCE	4.5 1.4	0.5 0.5	14, p. 6; 15, pp. 6, 7; 16, pp. 5, 6
251	1000571	06/15/2010	TCE <i>cis</i> -1,2-DCE	5.41 3.13	0.5 0.5	4, pp. 30, 58, 641, 687, 688, 783; Ref. 17, p. 1
	5049-1	08/16/2010	TCE <i>cis</i> -1,2-DCE	5.8 2.6	0.5 0.5	14, p. 3; 15, pp. 6, 7; 16, pp. 1, 2
No code, EPA sample 5049-15	5049-15	08/17/2010	TCE <i>cis</i> -1,2-DCE	4.4 1.6	0.5 0.5	14, p. 17; 15, pp. 12, 13; 16, pp. 22 – 24

Notes:

^a Well codes are those used by MDNR

* TCE in this sampled is estimated and the result is biased low due to low recoveries of surrogate analytes (Ref. 15, p. 5)

J The identification of the analyte is acceptable; the reported value is an estimate (Ref. 15, p. 2)

DCE Dichloroethene

µg/L Micrograms per liter

TCA Trichloroethane

TCE Trichloroethene

Level I Samples

A Level I drinking water sample is defined as a drinking water sample with concentration of a hazardous substance such as TCE that meets the criterion of an observed release at or above the hazardous substance's drinking water benchmark (Ref. 1, Section 2.5.2). Health-based benchmarks for the ground water migration pathway include the maximum contaminant level (MCL), the cancer risk screening concentration (CRSC), and the Non Cancer Risk screening concentration (NCRSC) (Ref. 1, Table 3-10). The EPA has set the following health-based benchmarks for TCE, *cis*-1,2-DCE, and 1,1,2-TCA:

- For TCE, MCL is 0.005 mg/L (5 µg/L), CRSC is 0.00021 mg/L (0.21 µg/L), and NCRSC is 0.011 mg/L (11 µg/L) (Ref. 2, p. 6).
- For *cis*-1,2-DCE, MCL is 0.070 mg/L (70 µg/L) and NCRSC is 0.36 mg/L (360 µg/L) (Ref. 2, p. 13).
- For 1,1,2-TCA, MCL is 0.003 mg/L (3 µg/L), CRSC is 0.0015 mg/L (1.5 µg/L), and NCRSC is 0.15 mg/L (150 µg/L) (Ref. 2, p. 14).

The lowest benchmark for TCE is the CRSC which is 0.21 µg/L. As shown in the contaminated well sample concentrations table above, none of the wells contained *cis*-1,2-DCE or 1,1,2-TCA at concentrations that exceed any benchmarks. The following table shows the drinking water samples collected at Compass Plaza Well TCE that exceeded the CRSC for TCE.

Well Code ^a	Sample Date	TCE Concentration (µg/L)	Reference
Compass Plaza Well	03/08/2010	3.07	2, p. 6; 4, pp. 28, 68, 69, 92, 93, 165, 170
	03/16/2010	3.84	
Citizens Bank of Rogersville	03/08/2010	2.25	2, p. 6; 4, pp. 74, 75, 90, 91, 163
	03/16/2010	2.11	
MDNR 176	04/15/2010	313	2, p. 6; 4, pp. 29, 57, 198, 199, 550, 551, 604, 605, 618, 619; 14, p.13; 15, pp. 10, 11; 16, p. 18
	04/22/2010	323	
	08/17/2010	180	
MDNR 168	04/15/2010	1.10	2, p. 6; 4, pp. 29, 57, 198, 199, 512, 572, 1327, 1377, 1378; 14, p.5; 15, pp. 6, 7
	04/21/2010	1.33	
	09/13/2010	1.41	
	08/16/2010	1.1	
MDNR 170	04/15/2010	2.27	2, p. 6; 4, pp. 29, 57, 198, 199, 524, 581, 582; 14, p.7; 15, pp. 8, 9
	04/21/2010	2.32	
	08/16/2010	1.2	
MDNR 102	03/30/2010	5.41	2, p. 6; 4, pp. 28, 57, 198, 199, 234, 235, 378, 404; 14, p.20; 15, pp. 14, 15
	04/14/2010	5.44	
	08/17/2010	5.4	
MDNR 104	04/14/2010	0.89	2, p. 6; 4, pp. 28, 57, 198, 199, 420, 1366, 1381, 1382; 14, p. 9; 15, pp. 5, 8, 9
	09/15/2010	1.26	
	08/16/2010	1.1	
MDNR 118	03/31/2010	4.79	2, p. 6; 4, pp. 29, 57, 198, 199, 238, 239, 390, 424; 14, p.15; 15, pp. 12, 13
	04/14/2010	5.19	
	08/17/2010	1.3	

Well Code ^a	Sample Date	TCE Concentration (µg/L)	Reference
MDNR 121	03/31/2010	0.65	2, p. 6; 4, pp. 29, 57, 198, 199, 236, 237, 342, 444; 14, p.8; 15, pp. 8, 9
	04/14/2010	0.97	
	08/16/2010	0.66	
MDNR 117	03/30/2010	3.57	2, p. 6; 4, pp. 28, 57, 198, 199, 238, 239, 386, 456
	04/14/2010	2.9	
MDNR 114	03/30/2010	6.36	2, p. 6; 4, pp. 28, 57, 198, 199, 228, 229, 320, 460; 14, p. 11; 15, pp. 10, 11
	04/14/2010	6.74	
	08/17/2010	6.2	
MDNR 124	04/14/2010	0.85	2, p. 6; 4, pp. 29, 57, 198, 199, 468, 1347, 1379, 1380; 14, p. 10; 15, pp. 8, 9
	09/15/2010	0.66	
	08/17/2010	0.74	
MDNR 181	04/22/2010	4.14	2, p. 6; 4, pp. 30, 58, 612, 613, 620, 621; 14, p. 6; 15, pp. 6, 7
	08/16/2010	4.5	
MDNR 251	06/15/2010	5.41	2, p. 6; 4, pp. 30, 58, 641, 687, 688, 783; 14, p. 3; 15, pp. 6, 7
	08/16/2010	5.8	
No code (EPA sample 5049-015)	08/17/2010	4.4	2, p. 6; 14, p. 17; 15, pp. 12, 13

Notes:

^a Well code is designated by the MDNR (Ref. 4, pp. 57 – 59).
µg/L Micrograms per liter

As documented above and shown in Figure 2, chlorinated solvents including TCE, 1,1,2-TCA and *cis*-1,2-DCE were reported in public and private wells located to the south and west of Rogersville, Missouri. By mid June 2010, the MDNR HWP had sampled 121 wells and 13 contained TCE; six of these wells had TCE at concentrations exceeding the EPA MCL (Ref. 4, pp 1538, 1539). Numerous private wells around the plume have been sampled and shown not to contain the chlorinated solvents (Ref. 4, pp. 25, 26, 45). Also as part of the SI, the state conducted a search for possible sources of the ground water contamination and collected soil samples from suspect areas (Ref. 4, pp. 9 – 17). No source of the TCE in ground water was identified (Ref. 4, p. 17). As documented in Section 2.2, investigations conducted to date in and around Rogersville have not identified a definite source for the chlorinated solvents found in ground water.

Hazardous Substance Released

Significantly elevated concentrations of VOCs including TCE, *cis*-1,2-DCE and 1,1,2-TCA have been observed in ground water sampled from public and private drinking water wells south and west of Rogersville Missouri. Sampling activities conducted to date have not identified the source of chlorinated solvents found in ground water wells. Because the area is karst, and ground water flow is unpredictable, tracking this contamination back to a source containing TCE, 1,2-DCE, and/or 1,1,2-TCA has been unsuccessful. In accordance with Section 3.1.1 of reference 1, an observed release by chemical analysis has been established and a value of 550 is assigned below and entered on line 1 of HRS Table 3-1.

Because an observed release has been established, potential to release is not evaluated.

Ground Water Observed Release Factor Value: 550

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

The hazardous substances listed in the table below have been documented in and associated with the ground water plume (Source 1). As documented in section 3.1.1 above, these hazardous substances were detected in release samples at concentrations significantly exceeding background levels.

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Does Hazardous Substance Meet Observed Release? (Y/N)	Toxicity/Mobility (Table 3-9)	References
1,1,2-Trichloroethane	1	1,000	1	Yes	1,000	1, Sections 3.2.1, 3.2.1.2; 2, p. 12
Trichloroethene	1	10,000	1	Yes	10,000	1, Sections 3.2.1, 3.2.1.2; 2, p. 6
cis-1, 2-Dichloroethene	1	100	1	Yes	100	1, Sections 3.2.1, 3.2.1.2; 2, p. 11

In accordance with Section 3.2.1.3 of reference 1, the hazardous substance with the highest toxicity/mobility factor value is entered below and on line 4 of Table 3-1. This hazardous constituent is trichloroethene with a toxicity/mobility factor value of 10,000.

Toxicity/Mobility Factor Value: 10,000
(Reference 1, Table 3-9)

3.2.2 HAZARDOUS WASTE QUANTITY

Source No.	Source Name	Source Type	Source Hazardous Waste Quantity
1	Ground Water Plume with no identified Source	Other	Greater than Zero

Sum of Values: Greater than Zero

As described in the HRS Rule Section 2.4.2.2, if the hazardous constituent quantity is not adequately determined for one or more sources, assign a factor value as follows. If any target for the ground water migration pathway is subject to Level I or II concentrations, assign either the value from Table 2-6 (Ref. 1, Section 2.4.2.2, Table 2-6), or a value of 100, whichever is greater, as the hazardous waste quantity factor value for that pathway. Because the source hazardous waste quantity value is unknown but greater than zero, according to Table 2-6, the assigned factor value is 1. Ground water pathway targets are subject to actual contamination at Level I concentrations; therefore, the hazardous waste quantity factor value is assigned a value of 100 (Ref. 1 Section 2.4.2.2.). This value is entered on line 5 of HRS Table 3-1.

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Section 2.4.2.2)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

As specified in the HRS Rule (Ref. 1, Section 3.2.3), the Hazardous Waste Quantity Factor Value of 100 was multiplied by the highest toxicity/mobility value of 10,000 for TCE, resulting in a product of 1,000,000 (1×10^6). Based on this product, a waste characteristics factor value (WCFV) of 32 was assigned from Table 2-7 of the HRS Rule (Ref. 1, Section 2.4.3.1). This value is entered on line 6 of HRS Table 3-1.

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100
Product = 1,000,000 or 1×10^6

Waste Characteristics Factor Category Value: 32
(Ref. 1, Table 2-7)

3.3 TARGETS

Targets considered include the four factors listed below; nearest well, population, resources and wellhead protection area (Ref. 1, Section 3.3). Population considers those residents, students and workers who regularly use the water (Ref. 1, Section 3.3.2). As documented below, the population factor is calculated differently based on whether the water from the point of withdrawal is subject to actual or potential contamination.

3.3.1 NEAREST WELL

Well ID: All private wells, except those listed as background wells, presented in section 3.1.1 of this documentation record contained TCE at concentrations that exceeded one or more benchmark concentrations. These private wells include the following using designators devised by MDNR: MDNR 176, MDNR 168, MDNR 170, MDNR 102, MDNR 104, MDNR 118, MDNR 121, MDNR 117, MDNR 114, MDNR 124, MDNR 181, MDNR 251, and EPA sample location 5049-15. The locations of these wells are shown on Figure 2 of this documentation record. The locations of the wells sampled by MDNR are shown on Figure 5 of the SI/RSE report (Ref. 4, p. 45).

Level of Contamination (I, II, or potential): Level I

Thirteen private wells and two public wells meet the criteria for an observed release subject to Level I concentrations. Since one or more ground water samples from the private drinking water wells meet the criteria for an observed release subject to Level I concentrations, a Nearest well Factor Value of 50 has been assigned in accordance with section 3.3.1 of reference 1. This value is entered below and on line 7 of HRS table 3-1.

Nearest Well Factor Value: 50
(Ref. 1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

The population served by water from a point of withdrawal may be evaluated based on the level of contamination for the point of withdrawal (Ref. 1, Section 3.3.2.1). Because previous sampling events indicate actual and potential target populations, the following sections detail the respective target values. The 4-mile target distance limit (TDL) is shown below as Figure 3. Contaminated private wells sampled by MDNR are described in Section 4.2 of the SI/RSE report (Ref. 4, pp 22 – 24) and are shown on Figure 5 of the report (Ref. 4, p.45). Contaminated private wells are also shown on Figure 2 of this documentation record.

The City of Rogersville municipal water supply utilizes two deep wells that draw exclusively from the Ozark aquifer (Refs. 4, p. 22; 20). A map showing the water mains and municipal well locations is presented in the SI/RSE report (Ref. 4, p. 44). Outside the city limits, it is apparent that privately owned community, non-community and private wells provide water to users (Ref. 4, pp. 22, 23, 41). State databases list 13 community and non-community public wells and 557 private wells near the site (Ref. 4, p. 23; 8, pp. 9 – 28). Approximately 45 percent of the recorded wells have open boreholes connecting the Springfield Plateau and Ozark aquifers (Ref. 4, p. 23; 8 pp. 1, 2).

Municipal well nos. 1 and 4 were sampled multiple times in 2010 and no TCE was ever reported (Ref. 4, pp. 26, 70-73, 100-103, 118-121, 132-133, 144-145, 148-151, 154-157). The Compass Plaza well and the well serving the Citizen's Bank of Rogersville were also sampled multiple times in 2010 (Ref. 4, pp. 26, 28). These wells provided water to workers and student populations (Ref. 4, pp. 7, 24).

In March, April and September 2010, 121 private drinking water wells were sampled by MDNR (Ref. 4, p. 26). Some of these wells were sampled multiple times. Of the wells sampled, 12 contained concentrations of TCE, 1,1,2 TCA or cis-1,2-DCE (Ref. 4, pp. 24, 28, 29, 30). Reported TCE concentrations ranged from non-detect to 369 µg/L (Ref. 4, pp. 28-30). In each well with TCE above the detection limit, concentrations of TCE exceeded the CRSC of 0.21 µg/L for TCE (Ref. 2, p. 6). In five of the wells, concentrations were also above the MCL of 5 µg/L for TCE (Ref. 2, p. 6; 4, pp. 28 – 30). One well contained TCE concentrations above the NCRSC of 11 µg/L (Ref. 2, p. 6; 4, p. 29).

EPA Region 7 directed Tetra Tech START to sample the wells at the site in August 2010 in support of a removal action (Refs. 13, p. 1; 14). START sampled one well at 9243 East Farm Road 186 that had not previously been sampled by MDNR (Ref. 14, p. 17). This well contained TCE at 4.4 µg/L, above the CRSC of 0.21 µg/L (Ref. 2, p. 6; 15, p. 13). These wells are all the known wells to contain chlorinated solvents. Continuing investigations are ongoing to identify and sample new wells.

3.3.2.2 Level I Concentrations

Populations served by the private wells sampled by MDNR are provided in the SI/RSE report (Ref. 4, pp. 23, 24). For the well sampled by EPA with the sample number of 5049-15, population served by the well was obtained during a February 22, 2011 sampling event (Refs. 14, p. 17; 19, p. 10).

The Compass Plaza Well was constructed in 2004 and draws water from the Ozark aquifer (Ref. 4, p. 7). In the spring of 2009, the Graceland Daycare connected to the Compass Plaza well which changed the wells status from a transient to a non-transient water supply (Ref. 4, p. 7). A non-transient non-community well is defined as a public water system that is not a community water system, and that regularly serves at least 25 of the same persons over six months per year (Ref. 4, p. 7). This non-transient system was assigned a public water system identification number (PWS ID) of MO5292838 (Ref. 4, p. 62). After TCE was detected in the well, the system was sampled multiple times and on September 29, 2010, the well was disconnected and connected to city water (Ref. 4, pp. 7, 28, 1555). For the period the well was in service, a conservative estimate of 25 persons served is used for scoring (Ref. 4, pp. 7, 24).

The Citizen's Bank of Rogersville well is a 545 feet deep, transient non-community well, and draws from the Ozark aquifer (Ref. 4, p. 7). Due to its proximity to the Compass Plaza well, the well was sampled by the PDWB on March 8 and 16, 2010 and was documented to contain TCE at 2.25 and 2.11 µg/L (Ref. 4, pp. 7, 74, 75, 90, 91). Because the well is potentially used by transient populations, only the worker population at the Bank will be used in scoring. It is assumed that at least one person may use the well on a daily basis.

Level I Well Codes	Aquifer No.	Population	Reference
Compass Plaza Well	Ozark Aquifer - 2	25	4, pp. 7, 24
Citizen's Bank of Rogersville	Ozark Aquifer - 2	1	4, pp. 7, 24
102	Not specified	4	4, p. 24
114	Not specified	2	4, p. 24
251	Not specified	2	4, p. 24
118	Not specified	3	4, p. 24
176	Not specified	2	4, p. 24
EPA 5049-15	Not specified	4	14, p. 17; 19, p. 10
124	Not specified	1	4, p. 24
104	Not specified	3	4, p. 24
117	Not specified	3	4, p. 24
170	Not specified	2	4, p. 24
181	Not specified	2	4, p. 24
121	Not specified	2	4, p. 24
168	Not specified	2	4, p. 24
Total Level I targets		58	

In total, at least 58 targets are subject to Level I contamination. Because these populations are subject to contamination above a health based benchmark, the number of targets is multiplied by 10 as specified in Section 3.3.2.2 of the HRS rule (Ref. 1) to produce a Level I concentration factor value of 580. These numbers are entered below and on line 8a of HRS Table 3-1.

Sum of Population Served by Level I Wells: 58
Sum of Population Served by Level I Wells x 10: 580

Level I Concentrations Factor Value: 580

3.3.2.3 Level II Concentrations

Level II population is not scored as all wells with actual contamination are subject to Level I concentrations .

Level II Concentrations Factor Value: 0

3.3.2.4 Potential Contamination

Potential contamination targets for the ground water migration pathway include all domestic and municipal ground water wells within 4 miles not subject to actual contamination at Level I or II concentrations (Ref. 1, Section 3.3.2.4). Data regarding each of the public and private drinking water wells found near the site, together with a figure showing the location of each well is provided in the DGLS Hydrogeologic Report (Ref. 8). The DGLS databases contain records of three municipal wells (City of Rogersville wells) within 4 miles of the site (Ref. 8, pp. 9, 10; see also Figure 3 of this documentation record). Rogersville City Well #2 is only used for monitoring purposes (Ref. 4, p. 22). As shown of Figure 3 of this documentation record, the two wells used for production (Wells #1 and #4) are located between 1 and 3 miles east northeast of the center of the ground water plume. They are both over 1,000 feet deep, drawing from the Ozark Aquifer, and are cased completely through the Ozark Confining Unit (Refs. 4, p. 22; 20, p. 2).

The most recent Census of Missouri Public Water Systems lists the population served by the City of Rogersville's two public well as 1,500 (Ref. 4, p. 22). Based on communications with the City of Rogersville in November 2010, the well system serves 1,100 connections (Ref. 4, p. 1482). According to U.S. Census Bureau estimates, the average household size in Rogersville is 2.7 people per household (Ref. 32). Based on these reported values, the total population served by the system is 2,970 (1,100 connections times 2.7 persons per household). A map showing the layout of the water lines in the system is provided as Figure 4 of the SI/RSE report (Ref. 4, p. 44). The proportion of the population served by each well (based on pumping capacity) is provided in the table below.

CITY OF ROGERSVILLE PUBLIC WELLS SYSTEM SUMMARY	
Total Population Served (persons)	2,970
Pumping Capacity Well#1 (gallons per minute)	180
Pumping Capacity Well#4 (gallons per minute)	350
Total Pumping Capacity (gallons per minute)	530
Proportion supplied by Well #1 (percent)	34
Proportion supplied by Well #4 (percent)	66
Pop Served by Well #1 (persons)	1,010
Pop Served by Well #4 (persons)	1,960

Source: Ref. 4, pp. 22, 23, 1482

Figure 3 illustrates the 0.25-, 0.50-, 1.0-, 2.0-, 3.0-, and 4.0-mile radius rings measure from the approximate center of the ground water plume. Only the municipal wells and the wells that serve the three public schools are included in the potential contamination scoring because they serve the greatest population.

Population served by the wells at the schools was estimated based on enrollment reported by the school district (Ref. 33). Reference 33 presents the approximate student population and is not believed to include staff. As a conservative estimate, only the student population was used in scoring.

Distance Category	Municipal and Private Drinking Water Wells	Apportioned Population (Individuals)	References	Distance-Weighted Population Value (Ref. 1 Table 3-12)
0 to 0.25	Not scored			Not scored
0.25 to 0.5	Not scored			Not scored
0.5 to 1	Not scored			Not scored
1 to 2	Rogersville well 1	1,010	4, pp. 22, 23, 45, 1482; 20; 32	294
2 to 3	Rogersville well 4 Logan-Rogersville Middle School Logan-Rogersville High School Total Population 2-3 miles	1,960 350 700 3,010	4, pp. 22, 23, 45, 1482; 20; 27; 28; 32, 33	678
3 to 4	Logan-Rogersville Primary School	350	4, p. 45; 29; 33	42
Total		4,370		1,014

Sum of Distance-Weighted Population Values: 1,014

Sum of Distance-Weighted Population Values/10: 101.4 rounded to 101

Potential Contamination Factor Value: 101

3.3.2.5 Calculation of Population Factor Value:

The total population factor value is the sum of the potential contamination factor (101), the Level I actual contamination factor (580), and the Level II actual contamination factor (0)(Ref. 1, Section 3.3.5). The total population factor is 681 (580 Level I + 0 Level II + 101 potential).

3.3.3 RESOURCES

Ground water use as a resource as defined in Section 3.3.3 of reference 1 has not been evaluated.

Resources Factor Value: 0

3.3.4 WELLHEAD PROTECTION AREA

A designated Wellhead Protection Area for the Rogersville public water supply system has been mapped within the 4-mile target distance limit (Ref. 20, p. 1). The maps provided in reference 20 are based on the Missouri Source Water Assessment Plan which was developed to implement the requirements of the Safe Drinking Water Act Amendments of 1996 for state Source Water Assessment Programs [sections 1453 and 1428(b)] (Ref. 22, p. 1). In accordance with Section 3.3.4 of reference 1 a value of 5 is assigned and entered below and on line 10 of HRS Table 3-1.

Wellhead Protection Area Factor Value: 5

3.3.5 CALCULATION OF TARGETS FACTOR CATEGORY VALUE

The total targets factor category value is the sum of the nearest well, population, resources, and wellhead protection area (Ref. 1, Section 3.3.5). The total targets factor category value is 50 (nearest well) + 681 (population) + 0 (resources) + 5 (wellhead protection area) = 736. This value is entered on line 11 of HRS Table 3-1.